GUIDELINES

FOR PREPARING

INITIAL ENVIRONMENTAL EVALUATION

ISSUED BY

CHAIRMAN

ENVIRONMENTAL ASSESSMENT PANEL

OCTOBER 1976

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D. SURRENDI	- Oil and Gas Exploration and Production
N. TYWONIUK	- Linear Transmission (Oil and Gas Pipelines, Electrical Power Transmission Lines, Highways and Railways)
D.I. GILLESPIE	- Hydro Electric and Other Water Development Projects.
P.W. SUMMERS	- Fossil Fuel Power Generation
D.M. FOULDS	- Nuclear Power Generating Stations
G.L. PINCOCK	- Airports
F.C. BOYD	- Ports
A. PICK	- Mining Developments
J. BETTS	- Industrial Developments

FOREWORD

This publication is the result of a Cabinet Directive which institutes the Environmental Assessment Process. These guidelines are issued by the Chairman, Environmental Assessment Panel in order to assist initiators in the preparation of Initial Environmental Evaluations. Such evaluations are individually a component of the Environmental Assessment and Review Process.

The development of individual guidelines was assigned to Task Force leaders, and was coordinated by the Chief, Panel Operations, Environmental Assessment Panel.

The major segments of this publication are:

a) the Introduction, which is common to all Generic Guidelines;

b) Generic Guidelines, which comprise nine separate guidelines or groups of guidelines; and,

c) Appendix A, which is also common to all Generic Guidelines. It is essentially a description of the procedures and responsibilities under the Environmental Assessment and Review Process.

In the very near future it is anticipated that a "General" guideline will be issued. The General guideline will be complementary to the Generic guidelines and will address those areas not already covered by Generic guidelines. Furthermore, as the need is identified, additional Generic guidelines will be issued, e.g. for such activities as dredging or forest spraying.

In addition to this consolidated publication, Generic guidelines will be published separately. As separate documents, each guideline will, of necessity, include the introduction, the technical component, and the appendix. In using either form of publication, i.e. consolidated publication or single generic publication, the "user" is encouraged to contact this Department for interpretation or clarification where necessary.

.../2

It should be noted that, to the extent possible, a uniform format has been adopted for all guidelines. The most noticeable exception is in the case of Nuclear Power Generating Stations, where an Initial Environmental Evaluation is not applicable and the guidelines are therefore used for "Site Selection" purposes.

At the time of printing not all guidelines had been received in final form from Task Force leaders, and a number of comments had been received for future consideration. It is intended therefore to revise these present guidelines in six month's time, and periodically as required, on the basis of "user" experience, comments at hand, and hopefully additional comments, so that by the process of evolution such guidelines will be continually improved. Users are therefore encouraged to send comments or observations to the undersigned in order that the results of such revisions may more satisfactorily reflect the requirements of all concerned.

H.M. Hill
Acting Chairman
Environmental Assessment
and Review Panel
September 1st, 1976

INTRODUCTION

The decision to institute a Federal environmental assessment policy was made by Cabinet on December 20, 1973. The Minister of the Environment was directed to establish, in cooperation with other ministers, a process to ensure Cabinet that:

a) environmental effects are taken into account early in the planning of new projects, programs and activities;

b) an environmental assessment is carried out for projects, programs and activities that are likely to have a significant effect on the environment;

c) the results of these assessments are used in planning, decision-making and implementation.

Federal projects are considered to be those that are initiated by federal departments or agencies, those for which federal funds are solicited and those involving federal property. Proprietary Crown Corporations and regulatory agencies are invited, rather than directed, to participate in the process. It should be stressed that it is the responsibility of initiating departments and associated proponents to satisfy all legislative, regulatory and Cabinet requirements related to the development and implementation of a project in addition to the requirements of this ministerial decision.

The process established by the Minister of the Environment, through the Inter-Departmental Committee on the Environment, is based essentially on the self-assessment approach. Departments and agencies are responsible for assessing the environmental consequences of their own projects and activities or those for which they assume the role of Initiator, and deciding on the environmental significance of the anticipated effects.

As early in the planning phase as possible, the initiating department screens all projects for potential adverse environmental effects. One of the following three decisions is possible from this procedure:

a) no adverse environmental effects, or environmental effects are known and are not considered significant. Effects identified can be mitigated through environmental design and conformance to legislation/regulations. The Initiator

is responsible for taking the appropriate action but there is no further need to respond to EARP procedures.

b) The nature of potential adverse environmental effects is not fully known. A more detailed assessment is required to identify environmental consequences and to assess their significance. The Initiator therefore prepares or procures an Initial Environmental Evaluation, (I.E.E.).

c) The Initiator recognizes that significant environmental effects are involved and requests the Chairman, Environmental Assessment Panels, Department of the Environment, to establish a Panel to review the project. (In this instance the initiating department has elected not to prepare or procure an I.E.E.).

If decision "b" is reached and an I.E.E. is prepared, a review of the I.E.E. will indicate to the Initiator whether alternative "a" or "c" above should be followed.

If the Initiator decides to submit a project for Panel Review, that project may not proceed until this review is completed and recommendations are made to the Minister of the Environment. The Panel established by the Chairman, EAP, issues guidelines for the preparation of an Environmental Impact Statement, (E.I.S.), by the Initiator or associated proponent, reviews the EIS; obtains the public response to the EIS and acquires additional information deemed necessary. It then advises the Minister of Environment, through the Chairman, on the acceptability (or otherwise) of the residual environmental effects identified. The Minister of the Environment and the Minister of the initiating department decide on the actions to be taken on the report submitted by the Panel. These are implemented by the appropriate Ministers and associated proponents.

A detailed description of Process procedures and responsibilities, including the definitions of terms used, is attached (see appendix A). To implement these procedures successfully and obtain maximum benefit from the Process, sufficient "lead time" in the planning phase of a project is required before construction is contemplated. This "lead time" is generally measured in years rather than months. There may be cases where the requirements of EARP and the normal planning system of the Initiator mesh in such a way that interim reports are indicated. This requirement should be established through discussion on a case-by-case basis.

The guidelines described herein are designed to assist individuals preparing Initial Environmental Evaluations. They might also be used by Panels that are reviewing projects of a similar nature, as a base document for the development of guidelines required in the preparation of Environmental Impact Statements. Additional sources of advice are the Regional Screening and Coordinating Committees operating in each of Environment Canada's regions under the functional guidance of the Chairman, EAP, where activities related to EARP are concerned.

The contents of an I.E.E. are discussed as follows under the headings: Overview Summary; Project Setting; Proposals, Description of Existing Environment and Resources Use; Environmental Impacts; Major Impacts and Mitigating Measures; and Residual Impacts.

G U I D E L I N E S

to prepare an

INITIAL ENVIRONMENTAL EVALUATION

for

O I L A N D G A S E X P L O R A T I O N A N D P R O D U C T I O N

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

OIL AND GAS EXPLORATION AND PRODUCTION

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NOTE: These guidelines are to include all land, water and marine based geophysical exploration, exploratory drilling, delineation drilling, production drilling for gas and oil, and gas plants.

1. OVERVIEW SUMMARY

The overview summary should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media (if this is required), or for use by senior executives requiring a rapid appraisal of the situation.

The overview summary should briefly describe the project, the probable significant environmental impacts, the ameliorating and mitigating measures to be implemented by the assessor, and the significance of the residual environmental impacts following amelioration or mitigation. Any aspects of the development which might stimulate public concern should be concisely described. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. THE PROJECT SETTING

2.1. Declaration

The individual proponent(s) and/or Initiator(s) must be identified and take full responsibility for all statements and judgements in the Initial Environmental Evaluation.

If more than one proponent is involved, the responsibilities of each proponent should be clearly identified.

2.2. The Need

The Initiator should provide evidence of the oil or gas demand for the proposed development. The timing of the project should be outlined with respect to this expected demand.

This section should include the primary purpose of the proposed project and how the proposed action fits into federal, provincial, regional and municipal plans and requirements. Forecast curves reflecting existing and historic oil and gas demands and the location of these demands should also be outlined.

2.3. Alternatives

The Initiator should provide a description of the alternatives considered, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits and environmental risks of the alternatives.

Extension of existing facilities where they exist and cancellation of the development or activity should be considered as alternatives.

2.4. Associated Projects

The Initiator should identify all projects that may be affected by the proposal and which in turn may cause environmental concern. Discuss the interrelationships of such projects and the environmental concerns identified whether or not these concerns fall within the jurisdiction of the proponent and/or Initiator.

The Initiator should also discuss the general, long-term, probable spin-off developments or activities resulting from the proposal in terms of their environmental effects.

3. THE PROPOSAL(S)

All viable alternatives not discarded in 2.3. above should be discussed under each of the following headings. Factors common to all viable alternatives may be discussed first followed by a description of the factors peculiar to each individual alternative.

3.1. General Layout

a) The legal site description and at least two maps should accompany the Initial Environmental Evaluation. The first map should be of a standard small-scale showing the proposed development or activity

in relation to geographic and environmental factors. The second map should be an orthophoto or bathymetric map of an appropriately large scale to provide more detail of the specific development area.

b) The application submitted by the proponent should also justify the extent of the lands applied for with due consideration to minimizing disturbance to the environment.

c) The development plan should include existing features such as the oil or gas permit area, the location and status of wells within the permit area, and all leases, acreages, roads, airstrips, borrow pits, buildings, camps, staging and storage areas, and ports or marine terminals.

d) The development plan should include proposed project features such as pipelines, well sites, plant sites, campsites, borrow pits, roads, airstrips, water sources, waste and sewage disposal sites, sumps, fuel storage areas, supply-staging areas, ports and marine terminals, connections to twin pipelines and all other facilities inside and out of the lease area, and proposed geophysical shot lines.

e) Schematic diagrams for all processing plant facilities and exploration or production wells should include the plant(s) or well site(s), camp and storage site; the relative locations of camp facilities, waste and sewage disposal areas, water supplies, storage areas for fuels, chemicals, explosives, construction materials, dykes and roads.

3.2. Construction Details

The following items should be described in concise terms:

a) The method(s) and timing of construction for each part or phase of the proposal.

b) The location, volumes required, and method of acquisition of local construction materials or services such as borrow pits, quarries, water supply, waste water disposal, gravel, dry dock facilities, housing and any other such requirements of the proposed type of development or activity.

c) Location and other details of access roads, increased use of existing roads and other transportation facilities.

d) Location, size, duration and services of construction camps or operational camps such as geophysical field crews.

e) Interruption to natural physical processes such as river flows or lake levels in terms of timing and other pertinent variables.

f) Any effluents and emissions in terms of quantity and characteristics, and noise or aesthetic factors caused or attributable to construction.

g) The location, method of construction, dredging requirements and scheduling for any ports and freshwater or marine terminals.

3.3. Operation and Maintenance

The following items should be described in concise terms:

a) The important timing and other commissioning details of the proposal.

b) The aesthetic features of the project.

c) Any interruption to natural physical processes such as river flows, groundwater regimes, lake levels, ice movements, etc. caused by the operation in terms of timing, space and magnitude.

d) Changes in the use of transportation facilities in terms of volumes and frequency of operation.

e) Expected releases, discharge or stockpiles of waste or toxic substances used or generated during all phases of the proposal with the identification of potential air, land or water contaminants.

f) The quantity and quality of liquid and solid by-products of drilling and production activity, their storage, disposal and ultimate fate.

g) Methods of waste disposal to avoid health hazards to humans and degradation of the environment.

h) Information should be provided on water requirements from streams, springs, lakes or marine waters including volumes, seasonal times of extraction, treatment and disposal for domestic, camp or operational purposes.

i) Location of camps and sewage disposal systems, sewage treatment facilities, anticipated disposal rates relative to receiving waters or drainage patterns.

j) The composition, volume and method of handling and disposal of solid wastes should be provided.

k) The nature, transportation, storage, use, treatment and final disposition of any pesticides, herbicides, pipe coating materials, anti-corrosion materials, flushing agents, testing fluids, special lubricants and other toxic substances proposed for use in the project and information on their expected persistence, mobility and ultimate fate in the surrounding ecosystem.

l) Quantities and qualities of atmospheric emissions such as sulphur compounds, hydrocarbons, nitrogen oxides, water vapour, heavy metals, thermal emissions and any other potential pollutants produced during all phases of the project.

m) The quantity and quality of other atmospheric emissions such as dust, noise, and odour produced by H_2S and other by-products of the proposal.

n) Contingency plans describing:

(i) How the possible loss of oil or gas through exploration, production or storage systems would routinely be detected and stopped. The maximum undetected loss from any phase of the operation should be calculated (this value should be as low as technologically feasible).

(ii) How oil, gas or other substances that may be toxic which have escaped into the environment would be detected.

(iii) Methods of fire prevention, detection, and suppression on the development, in the immediate area surrounding the development, on the right-of-way, and on lands involved in ancillary activities during construction, operation, and abandonment of the proposal.

(iv) Plans for countermeasures against the spread and effects of oil, gas and gas condensates and of other possible pollutants. These descriptions should be based on various scenarios of seasons and vagaries of the weather.

(v) The expected interface with existing or proposed contingency plans which are, or will be, the responsibility of other companies or agencies in the area.

(vi) Where applicable, the capability and timing required to drill a relief well; availability of extra well-head control equipment and its utility; inventory and locations of containment, clean-up and disposal equipment.

(vii) The roles and responsibilities of all personnel; government responsibility centres and established reporting procedures.

(viii) Where applicable, the various possible configurations in which a well could be abandoned temporarily; associated with these options state the minimum advanced warning times and times required for reconnection before drilling can be renewed.

(ix) The educational program for field personnel.

o) Where applicable, the drilling rig and platform covering such items as performance history, capacity, B.O.P. equipment and procedures, design against environmental threats (e.g. moving ice, storm surges, sub-bottom frozen materials, etc.), site position maintenance equipment, navigation and/or communication equipment, and qualifications of the drilling crew.

3.4. Abandonment

Plans for abandonment should include:

a) What equipment and facilities, including camps, will be removed when the proposal is terminated abandoned temporarily or permanently abandoned, how they will be removed and how the area will be reclaimed and/or stabilized.

b) The disposal and reclamation of gravel pads and roads to prevent interference with natural drainage systems or water bodies.

c) Contingency plans concerning the release or loss of any gaseous, liquid or solid contaminants.

d) The ultimate disposal of organic and/or mineral waste materials that were stabilized during the construction and operational phase.

4. DESCRIPTION OF THE EXISTING ENVIRONMENT AND RESOURCE USE

This section should describe the environment as it exists prior to project development with emphasis being placed on the environmental components that are of particular significance to the proposal. Consideration should be given to both the immediate environment and ancillary areas that may be affected. Present resource use in the areas concerned should be described in qualitative and quantitative terms. Knowledge gaps should be identified where they exist.

It is suggested that this section be developed in terms of the following points;

4.1. Climate

Consider and discuss the following where applicable:

- temperature in terms of daily and seasonal variations and extremes;

- temperature inversions by type, frequency and intensity as they relate to dispersal of atmospheric pollutants;

- winds in terms of velocity, frequency, direction and duration of critical wind speeds;

- precipitation in terms of kind, amount, duration and frequency;

- incidence of fog in terms of kind, duration and frequency;

- incidence of meteorological phenomena resulting from a combination of components such a wind chill, drifting snow or freezing rain;

- air quality and air pollution potential;

- climatic factors should be considered relative to the proposal in terms of such aspects as snow loads, structural icing, structural design relative to wind or ice stress, demobilization of equipment by icebergs, low ceilings and/or visibility associated with fog, cloud or precipitation as factors influencing operational efficiency or emergency procedures;

- with respect to rivers, ponds, lakes or marine areas, climatic factors should be considered relative to the proposal in terms of such aspects as structural design relative to ice stress; wind drift of ice and the movement of toxic substances in open water leads, cracks, under ice and entrained within the ice; the predictability of wind-driven surface currents, the predictability of wind-waves related to the emulsification of oil or other toxic materials; extreme waves relative to inundation of drilling platforms, service vehicles and staging areas; extreme storms relative to security of drilling platforms, service vehicles, support vehicles and staging areas; an estimate of wave spectra or periodicity which produce the maximum fatigue effects on drilling structures; internal waves related to possible buoyancy changes and natural vibrational periodicities of drilling-rig platforms; storm surges related to inundation of artificial islands, bottom-founded structures in shallow coastal areas or on low shorelines.

4.2. Terrain

Consider and discuss the following where applicable:

- the geology and landform parameters including bedrock, surficial geology, seismicity and mineral resources;

- the soils including composition, structure, nutrient levels, erosion properties, ice content, slumping and faulting properties;

- a rating of terrain susceptibility based on terrain performance after disturbance caused by the proposal;

- the geomorphology and seasonal variability of shorelines, lagoons and estuaries relative to the physics of shoreline sediment transport;

- land capability in terms of agriculture, forestry, wildlife, fisheries and recreation should be shown on a composite map.

4.3. Water

Consider and discuss the following subjects where relevant:

- watershed characteristics such as relief and vegetative cover.

- overland flow characteristics such as drainage channels and streams;

- groundwater characteristics such as subsurface drainage patterns, water table,seepage and permafrost conditions;

- quantity of surface water in the seasonal context recognizing seasonal peaks, floods, storm surges, break-up and freeze-up characteristics and ice jams;

- seasonal stream characteristics for problem areas relative to stream flow, channel dimensions, slope, bank and bed characteristics, scour potential, and stream behaviour with respect to channel shifting;

- seasonal quality of water for important aquatic habitat recognizing suspended sediments, dissolved oxygen, nutrient load, heavy metals, salinity, and hydrocarbons;

- hydrology of low-lands relative to inundations by storm surges, hurricanes, tsunamis and land run-off;

- expected oceanographic parameters and their seasonal variability that will determine the probable transport of pollutants considering such aspects as the statistical expectation of ocean currents, ice movements, ice cover, extent of open water and wave action;

- items such as moving ice, bottom scouring by ice sub-bottom frozen materials, wind waves and storm surges should be referenced to items 3.2. and 3.3.

4.4. Flora

Consider and discuss the following where applicable:

- identify the terrestrial, emergent and submergent aquatic, intertidal and marine plant communities and evaluate their distribution and susceptibility to alteration;

- species composition of vegetation, the communities involved in terms of relative abundance, ecological requirements and importance as fish and wildlife habitat and commercial significance;

- the effectiveness of different plant communities as insulators of permafrost.

4.5. Fish and Wildlife

Consider and discuss the following where applicable:

- migratory and resident animal populations including fish, amphibians, reptiles, birds and mammals whose habitats are to be affected by the proposal, with emphasis on seasonally important areas, densities, and biological requirements;

- fisheries (freshwater, marine and diadromous species), with emphasis on seasonally important areas, densities, migration habits, spawning requirements, and sensitivities;

- existing biological communities delineating sensitive areas, productivity and seasonal variations;

- the identification of any critical species which may be sensitive to the proposed development that act as important food resources for other co-habiting species;

- identification of species that may be considered rare or endangered, commercially, scientifically or recreationally important;

- historic trends in the use of the area by animal populations, particularly those of direct or indirect importance to man;

- the capacity of biological systems to assimilate possible pollutants resulting from the proposed development or activity;

- the identification of potential problem wildlife with particular reference to those that may be dangerous to man;

- predevelopment levels of potential environmental contaminants in the physical and biological components of the environment.

4.6. People

Consider and discuss the following where applicable:

- the distribution and characteristics of the human population including such aspects as life patterns, communities, employment, public facilities and housing, among others;

- cultural, social and economic setting of the general area, with recognition of resource use and the natural environment.

- the expected population changes resulting from people moving into and out of the area of proposed development.

4.7. Land and Resource Use

Consider and discuss the following where applicable:

- characteristic of the human population dependent on the resources of the area to be affected;

- existing land and resource use in the area of, and influenced by, the proposed development and ancillary activities;

- areas of special status such as ecological reserves, native land reserves, villages, fishing stations, hunting and gathering areas, areas of archeological, historic or paleontological significance, areas of religious or cultural importance;

- existing or potential recreational use of land and resources;

- aesthetic features of the area, especially those which are unusual;

- ownership (public, private or special status) of adjacent lands;

- status of regional plans including projected changes in supply and demand for land and water;

- projected urban and regional development.

5. ENVIRONMENTAL IMPACTS

Significant environmental effects should be discussed by issue in this section. Describe the potential impacts, the amelioraton and mitigation measures proposed and define residual impacts of selected alternatives.

The assessment of short and long-term potential environmental effects should be made on the basis of information collated from existing sources and on information collected in the field to supplement what is available. The extent, nature and effect(s) of knowledge gaps should be identified.

Potential environmental impacts in the area to be affected by the proposal should be discussed in terms of existing environmental values, and should be identified in the design, construction, operation, maintenance and abandonment phases of the project. The environmental values should be considered as international, national, regional, local or site-specific.

Information that may be required to carry out a satisfactory assessment shall include, but shall not necessarily be restricted to, topics outlined in this section. Options and measures available to avoid, minimize or mitigate harmful effects and to enhance beneficial effects are to be investigated and discussed under each topic. Plans for surveillance and monitoring of environmental effects should also be detailed. Impacts identified as major (more important) are to be discussed in detail in Section 6.

The Initiator should consider and discuss all potential environmental impacts in the area to be affected by the proposed development in terms of the headings identified in Section 4 and other factors considered pertinent to the particular task.

A Summary of this section should be made. This should include all concerns raised as well as the options and measures available to alleviate those concerns. Major concerns requiring detailed discussion in Section 6 should be summarized in this section.

6. MAJOR IMPACTS AND MITIGATING MEASURES

The Initiator should identify and discuss the major environmental impacts that may result from the development.

By way of example, some of the issues that may be identified after completing Section 5 are, among others:

a) changes in vegetative cover including effects of fish and/or wildlife habitat;

b) potential problems or terrain changes resulting from thawing of perennially frozen ground;

c) alterations of water regimes including the effects on habitat of fish and wildlife;

d) interference with fish and wildlife populations and the effect this interference may have on the use of these populations by man;

e) land use changes;

f) river or lake crossings that would lead to slope failures, gully erosion and related disturbances;

g) sites judged to be of archaeological or historical significance that require protection through ordinance or by some other means.

Major environmnental impacts are identified as those of long and short-term that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of, or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health of segments of the human inhabitants (deleterious as well as beneficial effects); or significantly change the environmental options.

The following should be outlined as part of the discussion of each major environmental impact for each alternative presented:

- description of the environmental impact in terms of the preceding;

- mitigating or ameliorating measures that can eliminate or minimize deleterious impacts. These should include location changes, design changes, changes in the scheduling of associated activities, rehabilitation of impaired features, environmental education of construction and operational staff, enhancement of beneficial impacts and contingency plans for major accidents;

- plans for surveillance and monitoring of environmental effects.

7. RESIDUAL IMPACTS

The environmental impacts that will remain after all practical mitigating measures have been incorporated into the alternative development proposals should be discussed in this section in terms of:

- the nature, extent and duration of all such impacts on the environmental and socio-economic spheres, and in the international, national, regional, local and site-specific context;
- the environmental significance of the potential residual impacts.

8. ANNEXES

The following should be included as Annexes in the Initial Environmental Evaluation:

8.1. an annotated list of references cited;

8.2. copies of reports developed from studies associated with the evaluation.

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INITIAL ENVIRONMENTAL EVALUATION

for

L I N E A R T R A N S M I S S I O N A N D T R A N S P O R T

Oil and Gas Pipelines

Electrical Power Transmission Lines

Highways and Railways

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

HIGHWAYS AND RAILWAYS

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Highways and Railways

1. OVERVIEW SUMMARY

The overview summary should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication be the media, (if this is necessary), or for use by senior executives requiring a rapid appraisal of the situation.

The overview summary should briefly describe the project, the probable significant environmental impacts, the ameliorating and mitigating measures to be implemented, and the significance of the residual environmental impacts following amelioration or mitigation. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. THE PROJECT SETTING

2.1. Declaration

The Initiator and/or proponent should be identified and should take responsibility for statements and judgements in the IEE.

2.2. The Need

The need for the proposed highway or railway should be outlined in terms of historic, present, and projected demands. Pertinent timing and routing factors associated with the demand should be discussed. The Initiator should detail how the proposed action fits into federal, provincial, regional, and municipal plans.

2.3. Alternatives

The Initiator should provide a description of the alternatives considered, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits, and environmental risks of all considerations.

The Initiator should consider alternative routes, the improvement of existing highways and railways, the use of alternative modes of transportation, the no-development alternative, and the postponement alternative.

2.4. Associated Projects

The relationship of the proposal to other existing or proposed projects should be outlined. This discussion should not be limited to transportation projects or only to those projects controlled by the Initiator. This section should also identify the possible environmental concerns that might arise through the stimulated development of associated projects. The possibility of shared use of the right-of-way should be discussed.

3. THE PROPOSAL(S)

The alternatives not discarded in 2.3. above should be discussed under each of the headings below. The factors common to all alternatives may be discussed first, followed by a description of the factors peculiar to individual alternatives. The technical and cost restraint on the design of the project should be included.

3.1. General Layout

The proposed alternative routes and rights-of-way should be illustrated on topographic or photomosaic maps of suitable scale. The maps should also indicate existing and other proposed highways, railways, and associated transportation facilities (e.g. pipelines, ports), work camps, and population centres. The Initiator should indicate the width of the right-of-way, and the locations of proposed bridges, tunnels, railway termini, overpasses and underpasses.

3.2. Pre-construction Details

The Initiator should describe:

a) nature and extent of right-of-way surveys;

b) extent of clearing and method(s) of disposal of accumulated materials, e.g. timber, slash overburden etc;

3.3. Construction Details

The Initiator should describe:

a) the clearing boundaries, methods, and scheduling for the right-of-way, access roads, drainage structures and stream crossings;

b) erosion control measures: bank stabilization, retention of wind-breaks, rip-rap protection, drainage ditches revegetation;

c) the mileage of cuts, fills, and embankment, methods of their construction and stabilization procedures;

d) gradients and degree of curvature to be used for railway lines;

e) the extent of use and locations of borrow sites including plans for use of borrow from, or adjacent to, watercourses;

f) the different designs of watercourse crossings (for seasonal and perennial streams) which will be used along the route; the criteria to be used in deciding the type of watercourse crossing;

g) schedules of construction, relocations, and development of public facilities;

h) sizes and types of construction equipment.

3.4. Operation and Maintenance

Describe timing and procedural details of:

a) maintenance under normal conditions; types of expected maintenance;

b) application of herbicides, pesticides or dust suppression chemicals;

c) monitoring and contingency plans to correct problems along the route;

d) expected traffic volumes and types in each direction of flow.

3.5. Abandonment

Describe the abandonment and rehabilitation procedures:

a) life expectancy of the project;

b) abandonment plans for temporary roads, rail lines bridges and culverts;

c) restoration of existing routes where they are abandoned as a result of reconstruction;

d) closure, revegetation, and/or alternative use plans for the route and right-of-way when its

useful life is terminated.

4. DESCRIPTION OF EXISTING ENVIRONMENT AND RESOURCE USE

This section should describe the environment as it exists prior to project development with emphasis being placed on the environmental components that are of particular importance to the area. The right-of-way and surrounding areas should be considered. Field and literature research should be carried out. Knowledge gaps should be identified where they exist. The Initiator should include a qualitative and quantitative description of present resource use. Maps of appropriate scale should be utilized in each subsection to illustrate resource and environmental information. Sources of information should be referenced along with a description of the methods of determination.

4.1. Climate

The location of the recording station(s) should be noted along with the historic climatic conditions that prevail in the vicinity of the proposed transportation pathway.

a) long-term means and extremes of temperature, precipitation, wind speed and direction, average depths of snow cover throughout the year;

b) the frequency of temperature inversions, fog, smoke, haze, freezing precipitation and thunderstorms;

c) delineation of avalanche and high wind zones or other special weather conditions.

4.2. Terrain

The information should be presented on maps of sufficiently large scale.

a) topography (with contours), landforms, surficial geology, bedrock geology, major soil types and indication of presence or absence of permafrost.

b) deritative map indicating material stability.

c) recognized or anticipated areas of instability (landslides, mudflows, snowslides, earthquake zones, etc.)

d) special, sensitive, or unique geological or landform features.

4.3. Hydrology

Describe important parameters of ground and surface waters:

a) physical, chemical and biological parameters (e.g. temperature, flow rate, water table height, physical and chemical stratification, river and lake levels, fish food likely to be affected by transportation route development; the normal seasonal variations and expected maxima and minima of these parameters;

b) quality, supply, present and proposed use of surface and ground waters;

c) location of sewage outfalls with respect to location of water supply intakes;

d) fluviological data: peak and minimum flow dates and levels, design discharge (i.e. 100 year flood), monthly velocity means, historic channel movement;

e) describe duration and extent of ice cover.

4.4. Vegetation

Describe the plant life in the corridor area:

a) map biogeoclimatic zones and forest cover; describe forest stand structure, maturity;

b) describe plant communities within the proposed corridor by species and common names; indicate relative abundance of species, importance to man, and importance to native fauna as habitat and food;

c) identify undisturbed, rare or unique vegetation; plant life of special economic, historic, social, or scenic value.

4.5. Fish and Wildlife

Describe:

a) abundance and distribution, within the area of development, of those species of fish, amphibians, reptiles, birds and mammals considered to be of significance with respect to sport, commercial, scientific, ecological or aesthetic value (listed by common and scientific names); distribution of non-vertebrate species considered to be important as food for the above-mentioned species.

b) rare or endangered species which may be affected by the corridor;

c) fish migration routing and timing and locations of spawning beds and nursery areas at and dowstream from watercourse crossings;

d) waterfowl migration routes and nesting area, timing and location;

e) areas critical to the life cycles of wildlife, migration pathways of big game animals, fur bearers, or other economically valuable species;

f) commercial and recreational fishing activities and catches;

4.6. People

Describe:

a) the social, economic and cultural setting of the area;

b) population distribution (including seasonal fluctuations if relevant), communities, employment, facilities and housing, within the area likely to be affected by the development;

c) discuss the housing requirements for the expected work force involved in the project (temporary and permanent);

d) attitude of the local population toward the development.

4.7. Land and Resource Use

Describe the nature, extent and location of present and projected utilization of land and resources. Reference to land classifications made under the Canada Land Inventory should be made where possible.

a) agriculture: crops, dairying, grazing, livestock, poultry, orchards, mixed farming, grain farming;

b) forestry: raw material use, types of production;

c) mining: past sites, present claims, areas presently being exploited or under feasibility study;

d) wilderness and recreational: provincial or national parks, areas administered by Conservation authorities, game preserves, ecological reserves, other recreational areas (e.g. camping, picnicking, sport fishing/hunting);

e) traditional: hunting, fishing, trapping;

f) urban: residential, commercial, industrial;

g) archaeological, historic, and scenic land use sites;

h) ownerships: public, private, or special status.

5. ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

The discussion should describe and compare the expected environmental impacts of the alternatives with emphasis on those actions which are likely to cause major environmental disruptions. The assessment of short and long term potential impacts should be made on the basis of information collected from existing sources supplemented by field data. Where factual data is unavailable or of questionable quality, the report should clearly state that the predicted effect(s) was based on subjective judgement and that knowledge gaps exist. Impacts should be considered for the pre-construction, construction, operation, and abandonment phases of the project.

The impacts should be categorized as direct or indirect - those that arise directly from the proposed project, such as interruption of fish migration due to a stream crossing, and those that arise because of secondary activities induced by the project, such as increased fishing pressure following improved access to an area.

The Initiator should consider and discuss all potential environmental impacts in the area to be affected by the project in terms which shall include, where appropriate, but not necessarily be restricted to, the topics identified in Appendix A. Options and measures available to avoid, minimize, or mitigate harmful effects or to enhance beneficial effects should be investigated and discussed under each topic. General mitigation considerations might involve changes in route, design, scheduling, or operations.

Summarize

- Concerns raised and options and measures available to alleviate those concerns.
- Major concerns for detailed discussion in the following section.

6. MAJOR IMPACTS AND MITIGATING MEASURES

The guidelines should request the Initiator to identify and discuss the major environmental impacts which may result from the development. The guidelines should identify the probable environmental issues.

Major impacts are identified as those of long and short term that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of, or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health of segments of the human inhabitants (deleterious as well as beneficial impacts); or significantly change the environmental options.

The following should be outlined as part of the discussion of each major environmental impact for each alternative:

- description of the environmental impact in terms of the above;

- mitigating or ameliorating measures that can eliminate or minimize deleterious impacts. These might include location changes, design changes, changes in the scheduling of associated activities, or rehabilitation of impaired features. Other measures that can be considered are environmental education of construction and operational staff, enhancement of beneficial impacts and contingency plans for major accidents.

- plans for surveillance and monitoring of environmental effects.

7. RESIDUAL IMPACTS

The environmental impacts that will remain after all mitigating measures are complete. For example:

a) nature, extent, and duration of impacts in the environmental and socio-economic spheres;

b) impact of increased access to wilderness areas, e.g. tourism, hunting and fishing pressure;

c) the environmental significance of the potential residual impact;

d) identify critical information gaps and propose terms of reference for studies to obtain the information necessary to complete the assessment.

8. ANNEXES

The Annexes should include:

8.1. an annotated list of references cited;

8.2. copies of reports developed from studies associated with the evaluation;

8.3. summaries of field data used to develop the description of the existing environment.

APPENDIX A

POTENTIAL AREAS OF ENVIRONMENTAL IMPACT

The following are examples of areas where environmental impacts may be anticipated.

1. Terrain and Vegetation

   a) methods of handling potential problems arising from earthquakes, landslides, avalanches, and other mass movements;

   b) methods of minimizing disturbance of vegetation and the organic mat in permafrost, particularly in ice rich areas;

   c) methods of minimizing instability due to differential thaw or freezing, loss of ground strength and thermokarst in permafrost areas;

   d) terrain stabilization and erosion control procedures including: revegetation, diversion structures, and rip-rap protection;

   e) plans for mining and borrow pit operations, including dimensions and volumes of excavations; location in relation to possible interactions with water bodies;

   f) borrow pit restoration - stabilization, revegetation, and disposition of surplus materials;

   g) proposed cuttings through forest; timing of operations; provisions for forest preservation, the utilization of lumber;

   h) locations, timing and methods of blasting; controls on proposed use of explosives (in particular in or near water bodies);

   i) plans for minimizing drainage disruption; extent of drainage disruption, where it is expected;

   j) impacts of cuts, fills and tunnels;

   k) plans to provide buffer zones of trees and natural vegetation adjacent to water bodies;

1) plans to schedule clearing and actual transportation route construction so that long intervals of years do not occur between the two operations.

2. Stream, River and Lake Crossings

a) scheduling, location, and design of watercourse crossings (temporary and permanent) as related to safe upstream and downstream passage of fish;

b) impact of crossings on runoff, bank erosion, migration of stream channels, ice jams, icings, upstream ponding and streambed scouring;

c) plans for fish passage structures when channel change or velocity barriers (e.g. at culverts) impede fish movement;

d) design and scheduling of approaches to river crossings so as to maintain stability of valley walls and river banks and to minimize changes that could lead to slope failures, gullying, and related disturbances;

e) methods of minimizing introduction of sediment or suspended solids to the water body during and after construction;

f) design and/or maintenance procedures to prevent the crossing from being clogged by floating debris or beaver dams;

g) routing decisions designed to avoid:

(i) watercourses in general

(ii) those regions frequented by fish

(iii) spawning beds

(iv) wet lands and marshes frequented by migratory birds

(v) encroachment on the flood plain of watercourses;

h) plans for the diversion or interruption of stream flows during construction.

3. Water Resources

a) probable effects on water supply sources and their use;

b) dates and proposed methods of construction within 300 feet of any water body frequented by fish;

c) interruption to river flows and changes in lake levels;

d) changes in groundwater hydrology and drainage patterns;

e) plans to use borrow from streams or add fill near or in any watercourse;

f) locations and volumes of water to be either removed or added to water bodies.

4. Fish and Wildlife

a) schedules of construction activities and evidence that the project contains the flexibility to allow construction to cease for periods of time when areas critical to fish, wildlife, or waterfowl are temporarily threatened;

b) impact of routing on traditional migration pathways: expected use of rail grade by migrating species (e.g. caribou); use of overpasses or deflection barriers to protect traditional pathways; possible delays or deflection of migration caused by the transportation system or attendant deflections barriers;

c) animal collisions:measures to discourage animal use of the rail line; snow ploughing procedures that allow animals to leave the rail line when collision is imminent; train operation procedures which help avoid collision; procedures for removal of carcasses to avoid secondary collisions involving scavengers;

d) plans for routing around or otherwise protecting sensitive areas for fish and wildlife such as breeding or staging grounds for waterfowl, big game, or fur-bearers and nursery, feeding and spawning grounds of fish;

e) safeguards proposed for the habitats of rare of endangered species;

f) methods of minimizing wildlife harrassment, increased hunting pressure and overfishing;

g) restoration of fish and wildlife habitats following construction.

5. Wastes, Toxins and Noise

a) methods of preventing sediment, slash, or other waste introduction to water bodies;

b) complete schedules and procedures of herbicide and pesticide use; type and quantity of chemicals; their expected persistence, toxicity, and mobility in the environment;

c) plans for disposal of solid wastes and sewage at work sites, camps and permanent wayside stops provided to service the travelling public;

d) anticipated noise problems and controls during construction and operation phases;

e) plans for the control of any discharge from locomotives or coaches;

f) location and volumes of waste water to be added to natural water bodies.

6. Land and Resource Use

a) impact on present and future land use where the transportation pathway passes through agricultural, forested, mined, wilderness, residential, commercial, recreational, private, or special status lands; details of relocations which may be required;

b) temporary restrictions on land use during construction, effects on local traffic patterns;

c) impact on aesthetic values of the landscape;

d) surveys to identify archaeological, historic, and scenic sites prior to and during the construction phase; procedures designed for the preservation of such sites.

7. Contingency Plans

Discuss:

a) derailment protection measures; provisions for the clean-up of accidental spills from rail cars or highway tankers and from hazardous materials used during construction;

b) procedures to repair the transportation pathway following land movements, floods, or destructive storms;

c) methods of fire prevention and suppression along the route;

d) procedures for removal of culvert blockages caused by icing, ice jams, or debris.

LIST OF REFERENCES

Canalog Logistics Limited and Canadian Pacific Consulting Services Ltd., 1974. Arctic Oil and Gas by Rail. Volume Two. Transport Canada.

Environmental Assessment and Review Process Office, 1975. Terms of Reference for the Preparation of Environmental Guidelines. Environment Canada.

Environmental Protection Service, 1975. First Draft Environmental Guidelines for Highway Development. Environment Canada.

Fisheries and Marine Service, 1975. Guidelines for the Protection of the Fish Resources of the Northwest Territories during Highway Construction and Operation. Technical Report Series CEN/-75-1 by R.L. Dryden and J.N. Stein.

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ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

ELECTRIC POWER TRANSMISSION LINES

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1. OVERVIEW SUMMARY

The overview summary should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media, (if this is necessary), or for use by senior executives requiring a rapid appraisal of the situation.

The overview summary should briefly describe the project, the probable significant environmental impacts, the ameliorating and mitigating measures to be implemented, and the significance of the residual environmental impacts following amelioration or mitigation. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. THE PROJECT SETTING

2.1. Declaration

The Initiator and/or proponent should be identified and should take responsibility for statements and judgements in the IEE.

2.2. The Need

The need for the electric power transmission project should be outlined in terms of historic, present, and projected demands. Timing factors and relationships with existing power sources and routes should be discussed in terms of demand. The location of the demand should be identified along with details on how the proposed action fits into federal, provincial, regional, and municipal plans.

2.3. Alternatives

The Initiator should provide a description of the alternatives considered, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits, and environmental risks of the alternatives.

The Initiator should consider alternative routes, the replacement or improvement of existing transmission lines, the use of existing utility corridors and the no action alternative.

2.4. Associated Projects

The relationship of the proposed electric power transmission line to other existing or proposed projects should be outlined. This discussion should not be limited to power developments or only to those projects controlled by the Initiator. The possibility of shared use of a utility corridor should be discussed.

3. THE PROPOSAL(S)

The alternatives not discarded in 2.3. above should be discussed under each of the headings below. The factors common to all alternatives may be discussed first, followed by a description of the factors unique to individual alternatives. The technical and cost restraints on the design of the project should be included.

3.1. General Layout

The proposed corridor and/or right-of-way location should be illustrated on topographic maps and aerial photographs of suitable scale. The maps should also indicate roadways and access routes, substations, work camps, power sources and other utility corridors.

3.2. Pre-construction Details

The Initiator should describe:

a) nature and extent of right-of-way surveys;

b) extent of clearing and method(s) of disposal of cuttings;

c) location and design of temporary stream crossings.

3.3. Construction Details

The Initiator should describe:

a) the clearing boundaries, methods, and scheduling;

b) the method of construction crew access (e.g. roadway, helicopter);

c) tower, conductor, and line selection, including all variations along the right-of-way;

d) design of crossings at streams, rivers, lakes, arms of the sea, and roadways;

e) tower and line heights and spacings intervals, in open country and at the various types of water and roadway crossings;

f) details of sites where undergrounding of the transmission line is proposed; the undergrounding technique, clearing procedures and boundaries;

g) schedules of construction, relocations, development of transportation and other public use facilities; indicate the numbers, sources, and housing needs of the work force;

h) location and standards of access roads.

3.4. Operation and Maintenance

The following items should be detailed with respect to scheduling and methods;

a) vegetation control (herbicides, cutting, etc.);

b) aerial and ground inspection and maintenance of transmission lines and their rights-of-way;

c) use of vehicles; maintenance of access roads.

3.5. Abandonment

The Initiator should describe abandonment and rehabilitation procedures including:

a) expected life of the project;

b) disposition of towers and lines when and if their useful life is terminated;

c) closure, revegetation, or alternative use programs for abandoned access roads and rights-of-way.

4. DESCRIPTION OF EXISTING ENVIRONMENT AND RESOURCE USE

This section should describe the environment as it exists prior to project development with emphasis being placed on the environmental components that are of particular importance to the area. The right-of-way and

corridor areas for all alternatives still considered feasible should be examined. Field studies should be carried out and knowledge gaps identified. A qualitative and quantitative description of present resource use should be included. Maps of appropriate scale should be utilized in each subsection to illustrate resource and environmental information. Sources of information should be outlined along with a description of the methods of determination.

4.1. Climate

The location of the recording station(s) should be noted along with the historic climatic conditions that prevail in the vicinity of the proposed transmission line.

a) extremes and means of monthly temperatures, precipitation, and wind speed and direction; 24 hour intensity of precipitation; depths of snow cover throughout the year;

b) the frequency of temperature inversions, fog, smoke, haze, freezing precipitation, thunderstorms and of combinations of icing and high winds.

4.2. Terrain

Describe:

a) topographic, physiographic, and geologic features and geomorphic processes at work within the proposed corridor;

b) physical and chemical characteristics of the soils; soil depth;

c) stability of slopes, permafrost, fire hazards, and erosion problems;

d) recognized geological and hydrological hazards such as land slides, mud flows, floods and earthquakes;

e) unique geological/landform features.

4.3. Water

Describe:

a) biological, chemical, and physical characteristics of surface and ground waters in the proposed corridor;

b) present and proposed use of surface and ground waters;

c) water supply sources located downstream from the right-of-way; sewage outfalls from temporary facilities.

4.4. Vegetation

Describe the plant life in the corridor area:

a) map biogeoclimatic zones and forest cover; describe forest stand structure, maturity;

b) describe plant communities within the proposed corridor by species and common names; indicate relative abundance of species, importance to man, and importance to native fauna as habitat and food;

c) identify undisturbed, rare or unique vegetation; plant life of special economic, historic, social, or scenic value.

4.5. Fish and Wildlife

Describe:

a) abundance and distribution within the area of development of those species of fish, amphibians, reptiles, birds, and mammals considered to have a significant sport, commercial, ecological, scientific, or aesthetic value (listed by common and scientific names);

b) rare or endangered species in or near the corridor;

c) migration pathways and schedules for fish, birds, and mammals;

d) critical habitats or sensitive areas for wildlife (e.g. nesting, rearing, migration, staging and wintering areas);

e) commercial and recreational fishing activities and catches, and the ability of fish populations to withstand increased pressure as a result of improved access to the area.

4.6. People

Describe:

a) characteristics of the population including numbers, distribution, communities, employment, public facilities and housing;

b) cultural, social, recreational, and economic setting of the area affected by the project;

c) attitude of local population toward the development;

d) ability of local communities to accomodate workers during construction and the need to provide new townsites, trailer parks or other housing arrangements.

4.7. Land and Resource Use

Describe the nature, extent and location of present and projected utilization of land and resources. Reference to land classifications made under the Canada Land Inventory should be made where possible.

a) agriculture: crops, dairying, grazing, livestock, poultry, orchards, mixed farming;

b) forestry: raw material use, types of production;

c) mining: past sites, present claims, areas presently being exploited or under feasibility study;

d) wilderness and recreational: provincial or national parks, areas administered by conservation authorities, game preserves, ecological reserves, other recreational areas (e.g. camping, pichicking, sport fishing/hunting);

e) traditional: hunting, fishing, trapping;

f) urban: residential, commercial, industrial;

g) archaeological, historic, and scenic land use sites;

h) ownerships: public, private, or special status.

5. ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

Evaluate all the expected environmental impacts with emphasis on those actions which are likely to cause major environmental disruptions. The assessment of short and long term potential impacts should be made on the basis of information collected from existing sources supplemented by field data. Where factual data is unavailable or of questionable quality, the report should clearly state that the predicted effects were based on subjective judgement and that knowledge gaps exist. Impacts should be considered for the preconstruction, construction, operation and abandonment phases of the project.

The Initiator should discuss and evaluate all potential impacts in the area to be affected by the proposed electric power transmission project in terms which shall include, where appropriate, but not necessarily be restricted to, the topics identified in 5.1 to 5.9 inclusive. Options and measures available to avoid, minimize or mitigate harmful effects should be investigated and discussed under each topic. General mitigation considerations would include changes in route, design, scheduling, or operations.

Summarize

- Concerns raised and options and measures available to alleviate those concerns.

- Major concerns for detailed discussion in section 6.

5.1. Aesthetics

The visual impact of electric power transmission lines can be a major concern. This concern demands subjective decisions as to what constitutes an acceptable visual impact. The Initiator should outline his intentions with respect to:

a) highway crossings: angle of crossing; tunnel effect through wooded areas; crossings at road intersections or interchanges; crossings at crests in the road; clearing near roadways; proximity of towers to the roadway;

b) routing adjacent to highways: areas where route will parallel highway; use of background, slopes, or vegetation to screen the view of the right-of-way; measures to preserve the view from the highway;

c) clearing: use of higher towers and line clearance to minimize the need for clearing; avoidance of areas of tall vegetation; feathering as opposed to clear cutting; other measures to minimize the adverse visual effect of clearing;

d) undergrounding: portions of the route where it is recommended; extent of clearing required;

e) plans for the use of multiple circuit towers;

f) routing decisions: to go through remote areas or use lands that have already been developed; routing in urban or suburban areas;

g) visual impact of substations, towers and insulators: design, location, colour scheme, glare factor.

5.2. Multiple Right-of-Way Use

a) use of an existing utility right-of-way: other utilities existing on, or proposed for, the right-of-way; possible conflicts of interest (e.g. effect of electric power transmission lines on communication lines); visual impact of electric power transmission lines in an areas already supporting utility systems;

b) agricultural use: rights-of-way through orchards, pastures, vineyards, cultivated and broadcast fields; cultivation of rights-of-way such as Christmas tree farms, sod farms, blueberry or other small fruit plantations;

c) recreational use: hiking, picnicking, golfing, horse riding, camping, snowmobiling, trail biking, cross country skiing.

5.3. Terrain and Vegetation

a) maintenance of soil and slope stability at tower pads, cleared areas, access roads;

b) use of helicopters, smaller vehicles, or winter construction to avoid landscape disturbance;

c) plans for topping, selective cutting, preserving topsoil, and protecting uncleared areas during and after construction;

d) revegetation scheme: return to original flora; establishment of field, herbaceous, or shrub vegetation; maintenance schedule to ensure revegetation;

e) plans for restoration of borrow sites, campsites and other areas of temporary disturbance;

f) ability of the proposed transmission line to withstand the anticipated effects of earthquakes, landslides, avalanches, floods, storms or icing.

5.4. Water Resources

a) probable effects on water supply sources and use;

b) effects of construction roads, bridges, culverts, underground or underwater structures and other facilities in or near water bodies, on stability of slopes, banks, or shores, siltation, sedimentation, scouring, and the possibility of creating barriers to fish (e.g. velocity barrier at a culvert);

c) anticipated changes in drainage patterns; boundary of drainage disruptions;

d) proximity of towers to water bodies, plans to parallel streams or rivers including provisions for buffer strips;

e) procedures and depth of placement of any underwater cables; relation of maximum depth of vessel anchor drag to the depth of cable burial;

f) methods of placement of underwater lines in relation to the elimination of habitat for bottom-dwelling and bottom-feeding organisms;

g) measures designed to ensure the safety of submarine power lines;

h) plans for blasting near water bodies.

5.5. Fish and Wildlife

a) plans for routing around or otherwise protecting intensively used flyways and areas used as breeding or staging grounds for migratory waterfowl, big game or fur-bearers;

b) scheduling of construction activities and evidence that the project contains the flexibility to cease construction when areas critical to fish, wildlife, or waterfowl are temporarily threatened;

c) safeguards proposed for the habitats of rare or endangered species;

d) methods of minimizing wildlife harassment during construction;

e) plans for controlling potential overfishing and hunting;

f) restoration of wildlife habitats following construction.

5.6. Wastes, Toxins, Noise and Electrical Interference

a) methods of disposal or utilization of cleared trees and vegetation; procedures for slash disposal particularly in permafrost, populated or sensitive areas, near water bodies;

b) methods of minimizing sediment, slash, or other waste introduction to water bodies;

c) complete schedules and procedures of herbicide use; type and quantity of herbicides and information on their expected persistence, toxicity, and mobility in atmospheric, aquatic, and terrestrial environments;

d) conductor noise, radio and television interference: anticipated mean levels and peaks during normal days and during rough weather conditions; measures to alleviate these problems;

e) ozone production from conductor, line, and substation corona discharge: anticipated levels of ozone production during a normal day and during adverse weather conditions; anticipated annual ozone production from the proposed electric power transmission line; effects of anticipated ozone production on agriculture or other plant communities, on structures and on the human population; measures proposed to decrease ozone production or mitigate its effects;

f) substation noise: placement of noisy apparatus, use of sound barriers, location of substations;

g) electrostatic field gradients under transmission lines; measures to protect people and livestock under the line from shock resulting from induced voltages.

5.7. Land and Resource Use

a) impact on land use and human health where the transmission line passes through agricultural, wilderness, forested, residential, commercial, recreational, private or special status lands; details of required relocations;

b) temporary restrictions on land use during construction; effect of construction on local traffic patterns;

c) surveys to identify archaeological, historic, and scenic sites prior to and during the construction phase; procedures designed for the preservation of such sites;

d) measures to lessen visual and environmental impact where transmission line passes through special areas;

e) proximity of proposed transmission line to established aviation pathways; height of lines and towers near airports or landing strips.

5.8. Environmental Emergencies

a) maintenance procedures to follow interruption of service; access route of repair crew;

b) safety precautions to avoid transmission line accidents and related human health hazards;

c) methods of fire prevention and control within the electric power transmission corridor.

5.9. Environmental Briefings and Monitoring

a) briefings to alert personnel of environmental restrictions during the pre-construction, construction, and operation phases;

b) plans to prepare readily understood handbooks for on-site construction supervisors and workmen;

c) continuous surveillance and maintenance programs for the electric power transmission right-of-way;

d) plans to monitor the environmental side effects during and after construction, including the progress of revegetation.

6. MAJOR IMPACTS AND MITIGATING MEASURES

The guidelines should require the Initiator to identify and discuss separately the major environmental impacts which may result from the development. Major impacts are identified as those of long and short term that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of, or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health of segments of the human inhabitants (deleterious as well as beneficial impacts); or significantly change the environmental options.

The following should be outlined as part of the discussion of each major environmental impact for each alternative:

- description of the environmental impact in terms of the above;

- mitigating or ameliorating measures that can eliminate or minimize deleterious impacts. These might include location changes, design changes, changes in the scheduling of associated activities, or rehabilitation of impaired features. Other measures that can be considered are environmental education of construction and operational staff, enhancement of beneficial impacts and contingency plans for major accidents.

- plans for surveillance and monitoring of environmental effects.

7. RESIDUAL IMPACTS

The environmental impacts that will remain despite all proposed mitigating procedures should be detailed in terms of:

a) nature, extent, and duration of environmental and socio-economic impacts;

b) the environmental significance of the potential residual impacts;

c) identify critical information gaps and propose terms of reference for studies to obtain the information necessary to complete the assessment.

8. ANNEXES

The Annexes should include:

8.1. an annotated list of references cited;

8.2. copies of reports developed from studies associated with the evaluation;

8.3. summaries of field data used to develop the description of the existing environment.

LIST OF REFERENCES

Environmental Assessment and Review Process Office, 1975. Terms of Reference for the Preparation of Environmental Guidelines. Environment Canada.

Federal Power Commission, 1971. Electric Power Transmission and the Environment. Washington, D.C.

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ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

OIL AND GAS PIPELINES

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1. OVERVIEW SUMMARY

The overview summary should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media (if this is necessary), or for use by senior executives requiring a rapid appraisal of the situation.

The overview summary should briefly describe the project, the probable significant environmental impacts, the ameliorating and mitigating measures to be implemented by the assessor, and the significance of the residual environmental impacts following amelioration or mitigation. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. THE PROJECT SETTING

2.1. Declaration

The Initiator and/or proponent should be identified and should take responsibility for statements and judgements in the IEE.

2.2. The Need

The Initiator should provide evidence of the demand for the proposed pipeline. The timing and routing of the project should be outlined with respect to this present or expected demand.

This section should include the primary purpose of the proposed facilities and how the proposed action fits into federal, provincial, regional, and municipal plans and requirements. Forecast curves, a description of existing and historic demands, and the location of the demand should also be outlined.

2.3. Alternatives

The Initiator should provide a description of the alternatives considered, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits and environmental risks of the alternatives.

Alternative pipeline routes, the upgrading of existing pipeline facilities, other methods of transportation, and the no-action alternative should all be considered.

2.4. Associated Projects

The relationship of the proposed pipeline to other existing or proposed projects (including those not controlled by the Initiator) should be discussed. This section should also identify the possible environmental concerns that might arise through the stimulated development of associated projects. The possibility of shared use of a utility corridor should be discussed.

3. THE PROPOSAL(S)

The alternatives not discarded in 2.3. above should be discussed under each of the headings below. The factors common to all alternatives may be discussed first, followed by a description of the factors peculiar to individual alternatives. The technical and cost restraints on the design of the project should be included.

3.1. General Layout

The corridor and/or route location should be illustrated on topographic or photomosaic maps of a suitable scale. Sizes and locations of rights-of-way, roadways and access routes, landing strips and helicopter pads, stockpile areas, compressor or pump stations, communication sites, and other ancillary facilities should also be shown.

3.2. Pre-construction Details

The Initiator [illegible]:

a) nature and extent of right-of-way surveys;

b) extent of clearing and method(s) of disposal of cuttings;

c) location and detail of temporary stream crossings.

3.3. Construction Details

The Initiator should describe:

a) all plant and operation units to be constructed such as compressors, pumps, unloading and storage facilities, liquefaction/gasification facilities, communication installations;

b) the length, pipe size, and the method of construction to be used for all transmission, lateral, looping, and gathering pipelines in the system;

c) design of stream, river, lake, and sea crossings, their approaches, and location of shut-off valves;

d) the clearing, boundaries and schedules for each construction segment;

e) schedules of construction, development of transporation and other public use facilities; indicate the numbers, sources, and housing needs of the work force;

f) requirements for construction materials such as concrete aggregate, granular fill, rip-rap;

g) location and standards of access and temporary roads.

3.4. Operation and Maintenance

The following items should be detailed:

a) the commissioning procedures of the project;

b) technical and operational procedures including, flow diagrams, timing schedules and inspections;

c) maintenance under normal conditions - types of expected maintenance, anticipated maintenance problems, and plans for any partial or complete shutdown associated with maintenance problems;

d) changes in traffic volumes and frequency due to operation.

3.5. Abandonment

The Initiator should outline the abandonment procedures.

a) plans for removal or other disposition of temporary structures and facilities;

b) plans for temporary roads, bridges and culverts; considerations may include the closing of roads to use and the removal of culverts or bridges except where removal would result in more disturbance than leaving them in place;

c) relocation or termination plans for all pipeline and related facilities.

d) plans for the rehabilitation of disturbed areas.

4. DESCRIPTION OF EXISTING ENVIRONMENT AND RESOURCE USE

This section should describe the environment as it exists prior to project development with emphasis being placed on the environmental components that are of particular importance to the area. The corridor and ancillary areas should be considered. Where knowledge gaps exist they should be noted. A qualitative and quantitative description of present resource use should also be included. Maps of appropriate scale should be included in each subsection to illustrate resource and environmental information. Sources of information should be referenced along with a description of the methods of determination.

4.1. Climate

The location of the recording station(s) should be noted along with the historic climatic conditions that prevail in the vicinity of the proposed pipeline.

a) extremes and means of monthly temperatures, precipitation, and wind speed and direction, average depths of snow cover throughout a year;

b) the frequency of temperature inversions, fog, smoke, haze, freezing precipitation and thunderstorms.

4.2. Terrain

Describe:

a) topographic, physiographic, and geologic features and geomorphic processes at work within the area of the proposed action;

b) physical and chemical characteristics of the soil and rocks present; soil depth;

c) stability of slopes, permafrost distribution and temperatures, active layer development, fire hazards, and erosion problems;

d) recognized geological and hydrological hazards such as land slides, mud flows, floods and the seismic hazards along the route;

e) unique geological/landform features.

4.3. Hydrology

Describe important parameters of ground and surface waters:

a) physical, chemical and biological parameters (e.g. temperature, flow rate, water table height, physical and chemical stratification, river and lake levels, fish food, productivity) likely to be affected by pipeline development; the normal seasonal variations and expected maxima and minima of these parameters;

b) quality, supply, present and proposed use of surface and ground waters;

c) location of sewage outfalls with respect to location of water supply intakes;

d) nature of tides, currents, bottom contours, wave action, and shoreline characteristics in areas of proposed offshore pipelines;

e) describe duration and extent of ice cover; extent of frozen ground below rivers;

4.4. Vegetation

Describe the plant life in the corridor area:

a) map biogeoclimatic zones and forest cover; describe forest stand structure, maturity;

b) describe plant communities within the proposed corridor by species and common names; indicate relative abundance of species, importance to man, and importance to native fauna as habitat and food;

c) identify undisturbed, rare or unique vegetation; plant life of special economic, historic, social, or scenic value.

4.5. Fish and Wildlife

Describe:

a) abundance and distribution, within the area of development, of those species of fish, amphibians, reptiles, birds and mammals considered to be of significance with respect to sport, commercial, scientific, ecological or aesthetic value (listed by common and scientific names); distribution of invertebrate species considered to be important as food for the above-mentioned species;

b) rare or endangered species which may be affected by the corridor;

c) fish migration times and locations of spawning beds at watercourse crossings;

d) timing and location of waterfowl nesting;

e) areas critical to the life cycles of wildlife and migration pathways of big game animals, fur bearers, or other economically valuable species;

f) commercial and recreational fishing activities and catches, and the ability of fish populations to withstand increased pressure as a result of improved access to the area.

4.6. People

Describe:

a) characteristics of the population including numbers, distribution, communities, employment, public facilities and housing;

b) cultural, social, recreational, and economic setting of the general area;

c) attitude of local population toward the development;

d) ability of local communities to accomodate workers during construction and the need to provide new townsites, trailer parks or other housing arrangements.

4.7. Land and Resource Use

Describe the nature, extent and location of present and projected utilization of land and resources. Reference to land classifications made under the Canada Land Inventory should be made where possible.

a) agriculture: crops, dairying, grazing, livestock, poultry, orchards, mixed farming;

b) forestry: raw material use, types of production;

c) mining: past sites, present claims, areas presently being exploited or under feasibility study;

d) wilderness and recreational: provincial or national parks, areas administered by Conservation authorities, game preserves, ecological reserves, other recreational areas (e.g. camping, picnicking, sport fishing/hunting);

e) traditional: hunting, fishing, trapping;

f) urban: residential, commercial, industrial;

g) archaeological, historic, and scenic land use sites;

h) ownerships: public, private, or special status.

5. ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

The discussion should describe and compare the expected environmental impacts of the alternatives with emphasis on those actions which are likely to cause major environmental disruptions. The assessment of short and long term potential impacts should be made on the basis of information collected from existing sources supplemented by field data. Where factual data are unavailable or of questionable quality, the report should clearly state that the predicted effect(s) was based on subjective judgement and that knowledge gaps exist. Impacts should be considered for the pre-construction, construction, operation, and abandonment phases of the project.

The impacts should be categorized as direct or indirect - those that arise directly from the proposed project, such as interruption of fish migration due to a pipeline stream crossing, and those that arise because of secondary activities induced by the project, such as increased fishing pressure following improved access to an area.

The Initiator should consider and discuss all potential environmental impacts in the area to be affected by the proposed pipeline in terms which shall include where appropriate, but not necessarily be restricted to, the topics identified in Appendix A. Options and measures available to avoid, minimize, or mitigate harmful effects or to enhance beneficial effects should be investigated and discussed under each topic. General mitigation considerations might involve changes in route, design, scheduling, or operations.

Summarize

- Concerns raised and options and measures available to alleviate those concerns.

- Major concerns for detailed discussion in the following section.

6. MAJOR IMPACTS AND MITIGATING MEASURES

The guidelines should request the Initiator to identify and discuss the major environmental impacts which may result from the development. The guidelines should identify the probable environmental issues.

Major impacts are identified as those of long and short term that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of, or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health of segments of the human inhabitants (deleterious as well as beneficial impacts); or significantly change the environmental options.

The following should be outlined as part of the discussion of each major environmental impact for each alternative:

- description of the environmental impact in terms of the above;

- mitigating or ameliorating measures that can eliminate or minimize deleterious impacts. These might include location changes, design changes, changes in the scheduling of associated activities, or rehabilitation of impaired features. Other measures that can be considered are environmental education of construction and operational staff, enhancement of beneficial impacts and contingency plans for major accidents.

- plans for surveillance and monitoring of environmental effects.

7. RESIDUAL IMPACTS

The environmental impacts that will remain despite all proposed mitigating procedures should be detailed in terms of:

a) nature, extent, and duration of environmental and socio-economic impacts;

b) the environmental significance of the potential residual impacts;

c) identify critical information gaps and propose terms of reference for studies to obtain the information necessary to complete the assessment.

8. ANNEXES

The Annexes should include:

8.1. an annotated list of references cited;

8.2. copies of reports developed from studies associated with the evaluation;

8.3. summaries of field data used to develop the description of the existing environment.

LIST OF REFERENCES

Department of Indian Affairs and Northern Development, 1972, Expanded Guidelines for Northern Pipelines.

Environmental Assessment and Review Process Office, 1975. Terms of Reference for the Preparation of Environmental Guidelines. Environment Canada.

Federal Activities Environmental Branch, 1975. Environmental Guidelines for Gas Pipeline Development. Environment Canada.

Federal Power Commission, 1973. Guidelines for the Preparation of Applications under Section 7C of the Natural Gas Act Pursuant to Order No. 415-C. Washington D.C.

APPENDIX A

POTENTIAL AREAS OF ENVIRONMENTAL IMPACT

The following are examples of areas where environmental impact may be anticipated.

1. Terrain and Vegetation

   a) methods of handling potential problems arising from earthquakes, landslides, avalanches, and other mass movements; design of pipeline and auxillary buildings with reference to the mitigation of such hazards;

   b) methods of minimizing disturbance of vegetation and the organic mat in permafrost or high ice-content areas;

   c) methods of minimizing instability due to differential thaw or freezing, loss of ground strength and thermokarst in permafrost areas; where uneven settlement or heave is inevitable, safeguards against pipe rupture or deformation should be proposed;

   d) terrain stabilization and erosion control procedures to be outlined including: revegetation, diversion structures, and riprap protection;

   e) plans for mining and borrow pit operations, including dimensions and volumes of excavations; location in relation to possible interactions with water bodies;

   f) borrow pit restoration - stabilization, revegetation, and disposition of surplus materials;

   g) proposed cuttings through forest; provisions for forest preservation, the utilization of lumber;

   h) locations and methods of blasting; controls on proposed use of explosives (in particular in or near water bodies);

   i) plans for minimizing drainage disruption; extent of drainage disruption, where it is expected.

j) methods of preserving the natural setting with the design and location of permanent facilities and the creation of buffer strips of natural vegetation between pipeline facilities, and public roads and facilities;

k) plans to schedule clearing and actual pipeline construction so that long intervals of years do not occur between the two operations;

2. Stream, River, Lake and Sea Crossings

a) water crossing designs and scheduling as related to interruption of spawning, rearing and safe upstream and downstream passage of fish;

b) for crossings beneath the watercourse - depth of maximum anticipated scour and of proposed placement of pipe, anticipated flow blockages either by pipe acting as a direct barrier or by ice buildup above a chilled pipeline;

c) pipeline routes through areas of water with potential for shorefast or drifting ice; relation of depth and location to ice flows, pressure ridges, and iceberg scouring;

d) depth of burial and associated construction activities in relation to the elimination of habitat for bottom-dwelling organisms and to sub-sea, lake or river permafrost;

e) impact of project associated runoff, bank erosion, migration of stream channels, river regime modification, ice jams, and icings;

f) plans for fish passage structures where structure change or velocity barriers impede fish movement;

g) design of approaches to river crossings so as to maintain stability of valley walls and river banks and to minimize changes that could lead to slope failures, gullying, entry of suspended solids, changes in water levels, degradation or growth of ground ice;

h) the design of culverts under access roads, and of overhead pipe spans for small stream and gully crossings; for culverts include predicted velocity profiles (lateral and longtitudinal);

i) methods to be used in the construction and removal of temporary stream crossings (e.g. materials to be used for reinforcement of ice bridges);

j) pipeline routes under water bodies with potential for vessel, traffic and anchorage; relation of maximum depth of anchor drag to the depth of pipeline burial;

k) specific measures designed to ensure the safety of offshore pipelines.

3. Water Resources

a) the hydrological and biological impact of water utilization in terms of planned sources, volumes required, and timing of extraction;

b) methods of minimizing the addition of sediment and introduction of oils and greases into water bodies, particularly in respect to access roads or bridges;

c) dates and proposed methods of construction within 300 feet of any water body frequented by fish and for activities involving a continuous downslope to a water body; creation of buffer strips of natural vegetation between pipeline facilities and water bodies;

d) interruption to river flows and alteration of lake levels in terms of timing and impact.

4. Fish and Wildlife

a) schedules of construction activities and evidence that the project contains the flexibility to allow pipeline, road, or other construction to cease for periods of time when important areas critical to fish, wildlife, or waterfowl are temporarily threatened;

b) methods of minimizing the restriction of movement of migratory animals (in particular large animals such as moose, deer, caribou);

c) plans for routing around or otherwise protecting areas used as: feeding or nesting areas by migratory waterfowl; as habitat by fur-bearers or big game animals; areas critical to the life cycles of wildlife;

d) methods of minimizing disturbance of wildlife populations resulting from greatly increased human intrusions - the operations of boats, ground vehicles, aircraft, and compressor or pumping stations;

e) safeguards proposed for the habitats of rare or endangered species;

f) plans for assessing and controlling potential overfishing and hunting;

g) plans to restore fish and wildlife habitats that are damaged by pipeline activities.

5. Waste, Toxins and Noise

a) methods of solid waste collection and disposal to avoid health hazards, dispersal by wind, or attraction of wild animals;

b) waste incineration procedures designed to minimize air pollution, ice fog, and fire hazards;

c) treatment and disposal of sewage with provisions to prevent seepage or leakage which may contaminate the environment;

d) the nature, transportation, use and disposal of any pesticides, herbicides, pipe coating materials, anti-corrosion materials, flushing agents, or other toxic substances, proposed for the project and information on their expected persistence, toxicity and mobility in surrounding ecological system; toxin storage facilities, distance from nearest watercourse;

e) plans for compressor station silencing equipment and/or physical barriers to noise; the level and frequency distribution of noise generated by construction and operations equipment;

f) proposed volume, composition and disposal of pipeline test fluids;

g) methods of disposal, incineration or other control of gaseous and liquid wastes from gas plants, compressor or pumping stations; anticipated quantities of emissions to the atmosphere;

h) measures to ensure that there will be no discharge of petroleum products or other pollutants into or onto any lands or waters;

i) methods of disposal or utilization of cleared trees and vegetation; procedures for slash disposal particularly in permafrost, sensitive or populated areas, near water bodies, etc.;

j) methods of minimizing sediment, slash or other waste introduction to water bodies.

6. Land and Resource Use

a) impact on land use where the pipeline corridor passes through agricultural, forested, mined, wilderness, residential, commercial, industrial, recreational, private, or special status lands; details of any relocations which may be required;

b) temporary restrictions on land use during construction; effect of construction on local traffic patterns;

c) impact on property values, historic, or potential land uses and regional land use plans;

d) impact of pipeline and its construction on those who derive their income from trapping, hunting, and/or fishing;

e) surveys to identify archaeological, historic, and scenic sites prior to and during the construction phase; procedures designed to ensure the preservation of such sites.

7. Environmental Emergencies

a) The statistical probability of accidental loss of the product from the pipeline, and the probable quantity of such loss;

b) The probable effects on people and on any environmental components, of accidental spills and combustion of products, inadvertantly released from the pipeline;

c) The adequacy, accuracy and effectiveness of routine methods and of systems for leak detection, and the maximum rate of loss of the product from the pipeline that could go undetected, and;

d) Contingency plans and response procedures for the protection and the safe removal and disposal of products accidentally or inadvertantly released into the environment, including:

   (i) provisions for the prevention and control of accidental spills of petroleum products and other toxic materials;

   (ii) spill containment and disposal procedures, equipment, and equipment stockpile locations;

   (iii) techniques and schedules for oil spill clean-up under all seasonal conditions on land, into water bodies and at major depots and storage areas;

   (iv) methods and procedures for restoration of the affected components of the environment.

e) Methods of fire prevention and suppression in the corridor with the maintenance of the necessary equipment caches and the availability of properly trained personnel for fire fighting in all areas where the pipeline crew's activities may cause fires.

G U I D E L I N E S

to prepare an

INITIAL ENVIRONMENTAL EVALUATION

for

H Y D R O E L E C T R I C A N D O T H E R W A T E R
D E V E L O P M E N T P R O J E C T S

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

HYDROELECTRIC AND OTHER WATER

DEVELOPMENT PROJECTS

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1. OVERVIEW SUMMARY

The overview summary should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable by the general public and in a format that allows it to be extracted directly for publication by the media if this is required, or for use by senior executives requiring a quick appraisal of the situation.

The overview summary should briefly describe the project, the probable significant environmental impacts, the ameliorating and mitigating measures recommended by the Initiator and the significance of the residual unmitigated environmental impacts. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. THE PROJECT SETTING

The details of the project setting shall encompass the identification of the Initiator and his agents, the justification for the project, its alternatives, and details of how this project fits into the general development schemes for the surrounding area.

The project may be any one of a number of different types, for example, power generation, flood control, irrigation, etc., or any combination of these and/or others.

2.1. Declaration

The Initiator must be identified and take responsibility for statements and judgements in the IEE. The Initiator's agent for carrying out the assessment must be identified, complete with qualifications and references. The terms of reference prepared by the Initiator for the assessment should be appended.

2.2. The Need

The Initiator must provide the justification for:

a) the demand for the project;
b) the location of the project at the proposed site; and
c) the timing, with respect to demand, for the project and related projects.

The Initiator must clearly describe the relationship of the proposed project to publicly adopted policy and plans, such as federal, provincial, regional or municipal.

The section should include demand forecast curves, a description of existing and historic demands and the location of the demand.

2.3. Alternatives

The Initiator must provide a description of all alternatives, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits and environmental risks of all considerations.

The alternatives to be considered must include, using a hydroelectric project as an example, not only alternative methods of generation (fossil and nuclear) but also siting alternatives, operational alternatives, the no-development alternative, and the postponement alternative.

2.4. Associated Projects

The Initiator should include in this section, the relationship of the project to other existing or proposed projects (perhaps not controlled directly by the Initiator) or as a component of larger plans or programs. It must also provide the possible environmental concerns that might arise through their stimulated development.

3. THE PROPOSAL

All alternatives not discarded in 2.3. above must be described under each heading. The factors common to all alternatives may be discussed first, followed by a description of the factors peculiar to individual alternatives.

3.1. General Layout

a) The location of the proposed project in terms of its geographic setting must be clearly defined. At least two location maps must accompany the report:
   (i) a small scale location map of the development area relative to readily recognizable geographical features such as major urban centres; and

(ii) a large scale mapproviding more details of the proposed development area. These maps should show elevation contours. They should also indicate the locations of environmentally sensitive features such as population centres, parks, game reserves and historic sites.

b) Diagrams and descriptions of the proposed dam facilities should be provided including dykes, spillways, coffer dams, power facilities, intake and discharge channels and structures, proposed fish passage facilities, spawning channels and/or hatcheries.

c) Comparative maps of the proposed reservoir area(s) before and after reservoir filling should be provided. The location(s) of dykes and/or control dams and water distribution canals should be noted and where diversions are proposed, maps of the entire length of both the augmented and the diminished stream channels should be provided.

d) Access facilities, construction and permanent roads, bridges, airstrips, wharves, and railway lines should be located on a map.

e) Town sites and camp sites with associated water supply sources and waste disposal areas should be located on a map.

f) The proposed communication system should be described.

3.2. Construction Details

The following items should be outlined:

a) The time for construction of each major part of the proposal and the intended construction schedule;

b) The construction methods to be used which could have a deleterious effect on the environment such as method of placing and removing coffer dams, extent of dredging, clear-cutting, diversion technique, large earth removal, etc. and possible alternative construction method(s) to the one(s) proposed which may prove to be less economical but provide less impact;

c) Borrow sites for local construction materials, such as sand, gravel, clay and stone, etc.; their removal and transportation techniques;

d) Estimates of quantities of pollutants (water, land, and air-borne) from the construction camps and the control of these pollutants;

e) A plan for environmental surveillance and monitoring during the construction. (This plan may require consultation with various services of DOE).

3.3. Operation and Maintenance

The following items should be outlined:

a) The commissioning techniques and their anticipated effects;

b) Quantities of waste materials produced by operation and maintenance programs of this project and their control;

c) Anticipated mode of operation including schedule of discharges and reservoir storage;

d) A plan for environmental surveillance and monitoring during operation.

3.4. Abandonment

The following items should be outlined:

a) The plans for abandonment of all structures, rehabilitation of disturbed areas, etc. contained in the construction, reservoir, or adjacent areas;

b) The plans for abandonment of the structure after useful life, if anticipated.

4. DESCRIPTION OF EXISTING ENVIRONMENT AND RESOURCE USE

This section should describe the environment as it exists prior to project development with emphasis being placed on the environmental components and quality characteristics that are of particular importance to the area. Where knowledge gaps exist they must be noted. It should consider both the immediate environment and ancillary areas that may be affected, e.g. improved access to the dam site

might result in increased resource exploitation in areas adjacent to the development site. Photographs or illustrations should be included to provide the reviewer with visual orientation of the existing environment. Maps should be used to relate the conditions described to specific areas.

A qualitative and quantitative description of present resource uses should be included.

4.1. Climate and Air Quality

The location of the recording station(s) and the period(s) of operation should be noted.

a) Precipitation (kind, amount, duration, frequency).

b) Winds (velocity, frequency, direction and duration of critical wind speeds).

c) Spring break-up and winter freeze-up dates.

4.2. Terrain

a) Geologic conditions on site or within the area of influence and possible seismic hazards.

b) Mineral resources or unique geologic/landform features.

c) Bank stability, permafrost, etc.

4.3. Water

The locations of recording stations and the period(s) of operation should be noted.

a) Hydrologic conditions of the river basin.

b) Water quality immediately upstream of the proposed project and in the downstream reaches in which impact is to be expected.

4.4. Flora

a) Highly productive habitats for fish and wildlife species.

b) Relatively undisturbed or unique vegetation; plant life of special historic or scenic value.

4.5. Fauna

a) Relative seasonal abundance and distribution of the species of fish, amphibians, reptiles, birds and mammals within the area of development.

b) Migration patterns and timing.

c) Rare or endangered species on site or in close proximity to the site.

d) Critical periods within the life cycles of selected species should be described (e.g. nesting period of waterfowl; spawning and nursery periods of fish).

4.6. People

a) Characteristics of the population including life patterns, communities, employment, public facilities and housing.

b) Cultural, social and economic setting of the general area.

c) Historical, archaeological and paleontological sites.

4.7. Land, Water and Resource Use

a) Land quality (land capability).

b) Existing and projected resource use, including land and water use for industry, agriculture, forestry, trapping, hunting, fishing and recreation, particularly in the area where growth or population shifts would be induced by the project.

c) Ownership (public, private or special status) of adjacent land.

d) Regional development plans.

5. ENVIRONMENTAL IMPACTS

The discussion must describe and compare the expected positive and negative environmental impacts of the selected alternatives with emphasis on those actions which will cause major environmental disruption. It should describe them

in terms of the time frames in which they will occur- construction, operation or phasing out. If factual data have not been available during the assessment or those that have been used are of questionable quality, the report must clearly state that the predicted effect(s) was based on subjective judgement and describe existing knowledge gaps.

The impacts should be categorized as direct or indirect - those that arise directly from the proposed project, such as river bank slumping and those that arise because of secondary activities induced by the project, such as increased resource use due to improved access. They should be identified as long term or short term impacts that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment or cause enhancement of, or conflict with, established traditional or historical land and water use and ways of life; or affect the livelihood or health of segments of the human inhabitants; or significantly change the environmental options.

The Environmental Impacts Section should include those actions that will result in irreversible and irretrievable commitments of the resources.

Detailed attention should be given to:

a) establishment of controlled flow releases in terms of volume and timing;

b) completed diagrams and descriptions of mitigation facilities such as fishways, intake screening devices or compensatory artificial fish production systems;

c) modification to operating schedules to facilitate fish and wildlife production and maintenance.

The format for presentation should follow that of Section 4. Appendix A, "Environmental Components and Functions of the Development", has been developed to assist the Initiator of hydroelectric and other water development projects in identifying the effect of project activities on environmental qualities. The following are some of the areas of concern that have been documented in previous assessments.

5.1. Climate and Air Quality

The type and size of a reservoir can lead to some changes in the local and downstream climate. These changes can eventually result in a modification of local terrestrial ecosystems.

Some of the more common changes that might occur are in:

a) precipitation rates; for example the distributions of convective showers and snow flurries may be affected by new reservoirs;

b) the extent of ice cover on waterways and the timing of freeze-up and break-up;

c) fog and ice fog intensitites; these may be affected by the project or by related changes in population and land use;

d) evaporation rates, for example when a new reservoir is created;

e) local winds, humidities and air quality may be affected by the project itself or related developments.

5.2. Terrain

The surrounding land could be affected significantly by the creation of a reservoir, construction techniques or improved access. Some of the common environmental qualities that could be affected by any or all of the project functions are:

a) geological stability as affected by the increased loading of reservoir waters;

b) bank stability and erosion;

c) the removal of surficial material during construction and operation;

d) unique landforms, historical, archaeological and paleontological sites;

e) mineral resources.

5.3. Water

Almost all project activities can have an effect on water - both ground and surface water.

The more important qualities that might be altered by the activities of the project are:

a) water quality during construction;

b) water quality during operation and maintenance;

c) drainage patterns and runoff rates;

d) groundwater hydrology;

e) unique physical features, such as rapids or falls;

f) sedimentation rates;

g) special water problems such as permafrost;

h) quantities of water as affected by diversions in or out of a waterway;

i) changes in the occurrence in waterways of ice jams, anchor ice and frazil ice.

5.4. Flora

Changes in the natural plant communities occur with changes in the area's climate, terrain and hydrological regime. These changes include:

a) species distribution and abundance;

b) the introduction of exotics;

c) plant vigour;

d) the destruction of unique associations;

e) increased exploitation through improved access;

f) the loss or gain of key habitats for fish and wildlife.

5.5. Fauna

Included among the faunal changes are not only those easily recognizable in fish, fowl, and wildlife populations but also the micro-organisms that form much of the basic food chain for the higher animals.

The following are some of the important characteristics to be considered:

a) changes in diversity and numbers;

b) the introduction of exotics;

c) the loss or reduction of rare or endangered species;

d) the disruption of food chains;

e) increased exploitation.

5.6. People

The construction and operation of a project can significantly alter the life style of the human population of the surrounding area, particularly in remote areas. The effects could be short term for the construction period or long term if the project results in induced activity and development.

Some of the important changes are in:

a) population numbers;

b) life style characteristics;

c) employment;

d) native peoples' rights.

5.7. Land, Water and Resource Use

A water related project can either expand or contract the land, water and resource use of an area by providing easier access or flooding useful land and resources. The results could be significant to the indigent population of the area. Conversely such a a project can be designed so as to increase the extent and intensity, or otherwise alter completely, the character of irrigation based farming practices.

Consideration should be given to some of the more important factors such as:

a) present and projected land use;

b) present and projected resource exploitation;

c) transportation;

d) industrial activity;

e) recreational activity;

f) area development plans, municipal, regional, etc.

5.8. Combined Impacts

Synergism of impacts may create a total effect in excess of each action. This subsection is, therefore, included to assure the reviewer that combination as well as single action impacts are considered. It should provide for an overall view of the project's environmental impacts in which the interrelationship and the interaction of the individual impacts are considered to give a combined impact assessment.

6. MITIGATING MEASURES FOR MAJOR IMPACTS

Many of the major impacts of water related developments can be lessened or eliminated by varying construction, design, or operation techniques. In this section, the major impacts described in Section 5 should be listed in point form together with recommended mitigating or remedial measures. Particular attention should be given to significant changes in land and water use patterns, surface and groundwater quality and quantity, and encroachment on wetlands, coastal zones, or fish and wildlife habitat. This land item has special significance when threatened or endangered species may be affected. Original or unique measures to mitigate against adverse environmental impacts should also be included for consideration.

7. RESIDUAL IMPACTS

Some of the significant impacts of Section 5 will remain unmitigated through lack of technology, incompatibility with the objectives of the project, or a complete lack of the

necessary detailed knowledge. These remaining impacts should be listed in this section in point form and reference made to the reason for its unmitigated state. This may serve as a guide to further study of the current project or future projects as deemed necessary, by an Environmental Assessment Panel.

8. ANNEXES

The Annexes to the I.E.E. should include:

8.1. an annotated list of references cited - i.e. documentation.

8.2. copies of reports developed from studies associated with the evaluation.

Appendices to these guidelines are as follows:

A - Environmental Components and Functions of the Development.

B - Engineering - Environmental Interface for Hydroelectric Developments.

APPENDIX A

ENVIRONMENTAL COMPONENTS

AND

FUNCTIONS OF THE DEVELOPMENT

2. Biological Characteristics

2.1. Flora

Introduction of Exotics
Trees
Shrubs
Herbs
Crops
Microflora
Aquatic Plants
Endangered Species
Barriers
Corridors
Diversity

3. Cultural Characteristics

3.1. Land and Water Use

Wilderness
Wetlands
Forestry
Pasture
Crop Lands
Residential
Commercial
Industrial
Mining
Transportation
Hunting
Fishing
Boating
Swimming
Camping
Picnicking
Resorts

3.2. Aesthetics

Scenic Views
Unique Biophysical Features
Parks and Reserves
Historial, Archaeological and Paleontological Sites
Rare or Unique Ecosystems

3.3. People

Life Style
Employment
Population Density
Health and Safety

II. FUNCTIONS OF THE DEVELOPMENT

1. Construction

Roads, Culverts and Bridges
Airstrips
Wharves
Railroads
Canals
Types of Vehicles
Ground Cover Removal
Blasting and Drilling
Burning
Marsh Fill and Drainage
Construction Camps
Permanent Townsite
Garbage Dumps
Water Supply
Diversions
Coffer Dams
Dredging
Diking
Dam and Generating Facility
Control Dams
Electrical Substation Yard
Intake Structure
Spillway
Surge Tank
Penstock
Tunnels and Underground Structures
Borrow Pits
Spoil Areas
Quarries
Fuel Storage
Spent Lubricants
Empty Fuel Drums
Collecting Sites
Application of Insecticides
Application of Herbicides
Road Applicants
Rip Rap

2. Operation

Landscaping Erosion Control
Reforestation
Reservoir Regulation
Reservoir Filling
River Control and Flow Modification
Road Maintenance

3. Abandonment

Borrow Pits
Spoil Areas
Garbage Dumps
Construction Camps
Structure Abandonment
Access Facilities

APPENDIX B

ENGINEERING - ENVIRONMENTAL INTERFACE

FOR

HYDROELECTRIC DEVELOPMENTS

APPENDIX "B"

ENGINEERING-ENVIRONMENTAL INTERFACE FOR HYDROELECTRIC DEVELOPMENTS

DEVELOPMENT STAGE	MILESTONES & MAJOR OUTPUTS	ENGINEERING/ECONOMIC ACTIVITIES	POSSIBLE ENVIRONMENTAL INTERFACE	NOTES
1. Demand	Defines need for new & expanded facilities & services	Monitor existing & historical demand levels Inventory existing facilities & services	Informal contact to discuss the need and possible conservation measures	Early contact allows maximum lead time on Environmental Assessment thinking
2. Concept	Formulate various project options Sites for various alternatives identified	Formulate various possible solutions to existing & forecast capacity demand problems First benefit cost study done.	Informal contact with governmental agencies to ensure alternatives are getting serious consideration	Project not defined Insufficient detail to warrant Environmental Assessment, but informal contact valuable
3. Feasibility	Site Selection	Refine demand forecasts Preliminary planning (rough sizing and functional layout) Cost estimates Financial feasibility	Major inputs to site selection Also inputs to preliminary planning and operational feasibility	Major benefits of Interface occur at this stage. Significant contribution

ENGINEERING-ENVIRONMENTAL INTERFACE FOR HYDROELECTRIC DEVELOPMENTS

DEVELOPMENT STAGE	MILESTONES & MAJOR OUTPUTS	ENGINEERING/ECONOMIC ACTIVITIES	POSSIBLE ENVIRONMENTAL INTERFACE	NOTES
3. (cont'd)		(Cash flow and financing) Economic feasibility (benefit & cost ratio) Operational feasibility site selection	Environmental aspects added to benefit cost Studies (Not quantified)	made before final site selected and while options are still available. Preliminary assessment report prepared at this stage.
4. Planning	Master plan report	Final demand forecasts Final functional layout and facility sizing Cost estimates improved Final financial and economic feasibility studies (if not established in Stage 3)	Continuing liaison valuable in many cases in final functional layout	In some cases stages 3 and 4 are lumped together in which case preliminary assessment report done here.
5. Design	Construction cost estimates	Preliminary engineering design, based on master	Liaison with respect to type and	Definitive assessment

ENGINEERING-ENVIRONMENTAL INTERFACE FOR HYDROELECTRIC DEVELOPMENTS

DEVELOPMENT STAGE	MILESTONES & MAJOR OUTPUTS	ENGINEERING/ECONOMIC ACTIVITIES	POSSIBLE ENVIRONMENTAL INTERFACE	NOTES
5. cont'd	design report construction financing usually arranged by this stage	plan Selection of construction materials & type of construction Preliminary selection of physical components Construction cost estimates	location of construction materials. Modifications to site and master plan, undesirable from engineering viewpoint, may be required.	report prepared here, if required.
6. Documentation (also called detailed design)	Call for tenders	Final selection of physical components Final design Preparation of detailed plans and specifications for construction Final construction cost estimates	Advise suitable modifications to mitigate undesirable impacts	Monitor design changes in the ongoing project, check for changing impacts by prepared for changes
7. Construction	Selection of contractors Construction takes place	Control construction schedule Obtain materials and supplies Build	Liaison re: access to remote sites Monitor cleanup on completion of construction	Witness testing Confirm design requirements are met
8. Operation and Maintenance	Facility produces required goods/services	Little or none except operational changes to optimize output	Monitoring by EPS	
9. Demand	PROCESS CONTINUES TO CYCLE THROUGH STAGES			

NOTE: The Engineering stages described above are generalized. Flexibility with respect to the Engineering-Environmental Interface may be required for individual development projects (especially in the early years of the Environmental Assessment Program).

G U I D E L I N E S

to prepare an

INITIAL ENVIRONMENTAL EVALUATION

for

F O S S I L F U E L P O W E R G E N E R A T I O N

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

FOSSIL FUEL POWER PLANTS

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1. OVERVIEW SUMMARY

The overview summary should consolidate the important findings of the report and should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media (if this is required), or for use by senior executives requiring a quick appraisal of the situation.

The overview summary should briefly describe the project, the probable major environmental impacts, the ameliorating and mitigating measures to be implemented by the assessor, and the significance of the residual unmitigated environmental impacts. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. THE PROJECT SETTING

2.1. Declaration

The Initiator should make a declaration of acceptance of responsibility for statements and judgements in the IEE. The individuals actually preparing the IEE, such as consultants, should be identified and qualifications and references included.

2.2. The Need

State whether this replaces or increases the capacity of an existing power plant or is a new plant where one did not exist previously. State whether the requirement for power is immediate or future and document the requirement with:

a) a description of existing and historical power demands;

b) the interrelationships between different and competing ways of fulfilling the demand and location of demand;

c) the estimated time period this power plant is expected to serve; the portion of the demand curve the project is expected to fulfill during this time and a brief description of any expansion or new facilities which will likely be required after that time;

d) details on how the proposed project fits into federal, regional, and municipal plans.

2.3. Alternatives

A description of the alternatives considered should be provided, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the benefits and disbenefits in terms of environmental and socio-economic factors. Different sites, extension of existing facilities, different methods of power generation and cancellation of the project should be considered as alternatives.

The capability and intention of satisfying the identified energy need through development of a combined electrical generation-district heating system should be indicated for any thermal power plant alternatives.

2.4. Associated Projects

The relationship of the proposed fossil fuel power plant to other existing or proposed projects should be outlined. This discussion should not be limited to power developments or only to those projects controlled by the Initiator. The probable spin-off developments of the project should also be discussed.

3. THE PROPOSAL(S)

The alternatives not discarded in 2.3. above should be discussed under each of the headings below. The factors common to all alternatives may be discussed first, followed by a description of the factors peculiar to individual alternatives.

3.1. General Layout

(a) Maps of several scales should be provided to identify the location of the power plant in relation to surrounding communities, industrial developments, existing or planned development amenable to district heating or other use of reject heat, recreational areas and parks, water supply and waste water treatment facilities, existing transmission and transportation routes, prime agricultural land, etc.

(b) Plans should be provided showing the location of stacks; storage areas for fossil fuels and chemicals; transformers; systems for waste collection, containment and disposal; effluent releases to nearby water bodies; cooling system features including intakes, outfalls, towers, ponds and reservoirs; and interconnections with heat distribution systems for district heating.

(c) Access routes (land or water), transmission corridors and other such features particular to the project should also be identified.

(d) The above should indicate immediate requirements together with proposed locations in the event of future expansion.

3.2. Construction Details

The following items should be outlined:

(a) the method and timing of construction for each part of the proposal;

(b) the place and method of acquisition of local construction materials; for example sand, gravel, water supply and any other requirements of the proposed type of development;

(c) details of access roads; increased use of existing roads and other transportation facilities;

(d) location, duration, size, and services of construction camps;

(e) any interruption to natural processes such as river flows, lake levels and ground water regimes; siltation of natural water bodies during construction of intakes, outfalls, dykes, dams etc. in terms of where and when such will occur;

(f) any effluents, emissions, noise or aesthetic factors caused by the construction.

3.3. Operation and Maintenance

The following items should be detailed:

(a) the important timing and other commissioning details of the proposal, such as the operating schedule;

(b) the volume, timing, composition and other details of liquid effluents, method of treatment and detention periods for various liquid wastes such as blowdown and ash slurries, method of application of biocides and corrosion inhibitors, volume and temperature characteristics of cooling water, predicted aereal extent of thermal plumes, volumes and characteristics of make-up water, consumptive water use, etc.

(c) the volume, timing, composition and other details of expected air emissions (for example sulphur dioxide, nitrous oxides, particulates including coal dust from stockpiles), noise, and solid waste disposal; a description of the proposed emission control equipment should be provided (Environment Canada advocates containment at the source through the use of best practicable technology);

(d) the aesthetic features of the project;

(e) any interruption to natural processes such as river flows, ground water regimes, growth of flora, lake levels etc. caused by the operation in terms of timing, space and magnitude.

3.4. Abandonment

Life expectancy and plans for the abandonment of the project including rehabilitation, should be detailed where pertinent.

4. DESCRIPTION OF EXISTING ENVIRONMENT AND RESOURCE USE

This section should describe the environment as it exists prior to project development for each alternative with emphasis being placed on the environmental components that are of particular importance to the project and surrounding area. It should consider both the immediate environment and ancillary areas that may be affected. A qualitative and quantitative description of present resource use in the areas concerned should be included, as well as the identification of knowledge gaps where these exist.

It is suggested that the description be developed in terms of the headings listed below.

4.1. Meteorology and Air Quality

(a) Local surface wind speed and direction on a monthly/seasonal and annual basis - use wind roses.

(b) Wet and dry bulb temperature distribution on a monthly/seasonal and annual basis - include means and extremes.

(c) Kind, amount, duration and frequency of precipitation by wind direction on a monthly/seasonal and annual basis.

(d) Frequencies, heights, intensities and duration of surface-based inversions on a monthly/seasonal and annual basis.

(e) Frequency distributions of mixing heights and mixing layer wind speeds on a monthly/seasonal and annual basis.

(f) Frequency distributions of atmospheric stability (Pasquill-Turner type) on a monthly/seasonal and annual basis.

(g) Fog occurrence frequencies (including ice fog where applicable) on a monthly/seasonal and annual basis.

(h) Information on meteorological facilities, such as site locations and levels employed (at least one should be at stack height), instrument distribution, data handling (e.g. information gathered, archiving procedures) and plans for future meteorological support.

(i) Baseline levels of constituents to be emitted to the atmosphere (e.g. sulphur dioxide, oxides of nitrogen, particulates, etc.) and the corresponding information on how and where these levels were measured (i.e. type of equipment employed).

4.2. Terrain

The following land suitability and land capability factors for the project area should be presented on maps of sufficiently large scale. Include transmission corridors and areas occupied by coal mining or other operations directly associated with the project.

(a) Land capability in terms of agriculture, forestry, wildlife, fisheries and recreation may be shown on a composite topographic map.

(b) Important land forms, bedrock formations, surficial deposits, mineral resources, soils, in terms of their suitability for the proposed development including errosion and slumping characteristics.

(c) Recognized geological hazards such as land slides, or earthquakes.

(d) Chemical characteristics of the soils in the area.

4.3. Water

The physical, chemical and hydrological characteristics of the surface and ground waters of the project area and immediate environs should be outlined including such factors as:

(a) Lateral and vertical dimensions, nearshore depths and bottom gradients, surface area, shape and volume of water body.

(b) Range and time variation of flow, velocity and water level, circulation patterns, dispersion characteristics and wave, seiche and tidal effects.

(c) Natural temperature ranges and time and spacial temperature variations for the water body, lateral and vertical temperature stratification and natural turnover times.

(d) Average and extreme concentrations of dissolved oxygen, nutrients, solids, heavy metals and other chemical constituents.

4.4. Flora

(a) Terrestial and aquatic plant communities by species composition, their relative abundance and their importance to fauna as habitat and food species.

(b) Susceptibility of terrestrial and aquatic plant communities - particularly to constituents to be released into the ecosystem by the proposed plant (e.g. sulphur dioxide).

(c) Relatively undisturbed, rare, or unique vegetation; plant life of special historic, scenic or economic value.

4.5. Fish and Wildlife

(a) Relative abundance and distribution within the area of development of those species of fish, amphibians, reptiles, birds, and mammals considered to have a high sport, commercial, scientific, or aesthetic value (listed by common and scientific names).

(b) Susceptibility of fish and wildlife - particularly to constituents to be released into the ecosystem by the proposed project.

(c) Rare or endangered species in or near the project area.

(d) Times and location of nesting or spawning, nursing, staging, wintering, migration, etc.

4.6. People

(a) Population numbers, distribution, employment, facilities, and housing in the project and nearby areas.

(b) Cultural, social and economic setting of the general area.

4.7. Land and Water Resource Use

(a) Present and projected future land and water uses in terms of commercial and recreational interests and values (e.g. farming, fishing, shipping, boating, etc.)

(b) Ownership (public, private or special status) adjacent land.

(c) Status of regional plans (projected changes - supply and demand for land and water).

(d) Areas of potential special status.

(e) Projection of related urban and regional development.

(f) Traditional land use patterns (native hunting, trapping, fishing and areas of religious significance).

(g) Archaeological and historic land uses and sites.

5. ENVIRONMENTAL IMPACTS

The Initiator should describe and compare the potential environmental impact of the selected alternatives. The assessment of short and long term potential impacts should be made on the basis of information collated from existing sources and on information collected to supplement what is available. The effects of knowledge gaps should be identified.

Potential environmental impacts in the area to be affected by the proposed development should be discussed for each alternative in terms of existing environmental values and should be identified in the design, construction, operation and maintenance, and abandonment phases of the project. When discussing the effects of pollutant emissions or discharges, possible synergistic effects should also be considered. The following should be included:

(a) The Initiator should consider and discuss all environmental impacts in the area to be affected by the proposed development in terms of the headings identified in Section 4 and other factors considered pertinent to the particular impact.

(b) Options and measures available to avoid, minimize or mitigate harmful effects and to enhance beneficial effects are to be investigated and discussed under each topic.

(c) The major* impacts are to be identified in this section and discussed in detail in Section 6.

(d) The Initiator should outline plans for surveillance and monitoring of the environmental effects.

(e) The Initiator should summarize the concerns raised and options and measures available to alleviate those concerns.

6. MAJOR IMPACTS AND MITIGATING MEASURES

The Initiator, should identify and discuss the major environmental impacts which were previously identified in Section 5, which may result from the development. The discussion of impact and mitigating measures should be directed toward the impacts that still exist after best practical technology has been implemented. The following should be outlined as part of the discussion of each major environmental impact.

(a) Description of the impact.

(b) Mitigating and ameliorating measures that can eliminate or minimize deleterious impacts. These might include location changes, design changes, changes in the scheduling of associated activities, or rehabilitation of impaired features. Other measures that should be considered are environmental education of construction and operational staff and enhancement of beneficial impacts.

(c) Plans for surveillance and monitoring of environmental effects.

(d) Where applicable, contingency plans for major accidents (e.g. fuel spills, etc.)

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* Major impacts are identified as those of short or long terms, that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health or segments of the human inhabitants (deleterious as well as beneficial impacts), or significantly change the environmental options.

7. RESIDUAL IMPACTS

The Initiator should detail the environmental impacts that will remain after all practical mitigating measures have been incorporated into the alternative development proposals in terms of:

(a) Nature and extent and duration of all such impacts in the environmental and socio-economic spheres and in the international, national, regional, local and site specific content.

(b) the environmental significance of the potential residual impacts.

8. ANNEXES

The Initiator should include:

(a) An annotated list of references cited.

(b) Copies of reports developed from studies associated with the evaluations.

G U I D E L I N E S

to prepare an

INITIAL ENVIRONMENTAL EVALUATION

(Site Selection)

for

N U C L E A R P O W E R G E N E R A T I N G S T A T I O N S

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

Site Selection

NUCLEAR POWER GENERATING STATIONS

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1. INTRODUCTION

1.1. General

Normally, an Initial Environmental Evaluation (IEE) will be required of the project as the first decision point of the EARP. However, in all cases where nuclear power generating station projects are considered, it has been agreed that an Environmental Impact Statement (EIS) will be required. In such cases, the IEE is therefore superfluous as an indication of the environmental significance of the project. It is nevertheless the most effective mechanism for the purpose of preliminary site selection and for ensuring that environmental concerns are appropriately addressed in the preliminary planning stages of a project for a nuclear power generating station, prior to the proponent's request for assistance in preparing an EIS.

The environmental assessment exercise comprises the Site Selection Process, followed by the Site Evaluation Process. In the Site Selection Process, candidate sites for the project are compared and ranked on a preliminary basis so that the sites which are considered environmentally acceptable and have lower potential for adverse environmental impact will be selected for further consideration. The Site Selection Document, prepared at this stage, will be similar in all respects to the (IEE) documentation referred to in the earlier "Introduction". In the Site Evaluation Process, an Environmental Impact Statement will be prepared, documenting the detailed environmental assessments carried out to determine the most preferred site for the project.

This guideline document is designed therefore to help the Initiator select alternate sites in the Site Selection Process.

It should be stressed that it is the Initiator's and proponent's responsibility to satisfy all legislative and regulatory requirements associated with the development and implementation of a project, in addition to the requirements in the ministerial decision.

There may be cases where the requirements of EARP and the normal planning process of the Initiator mesh in such a way that interim reports are indicated. The need for these should be established, through discussion, on a case by case basis.

This guideline document is also intended as a base document in the development of site-specific Environmental Impact Statement Guidelines.

1.2. Site Selection Process

The site selection of a proposed nuclear power development project should be regarded as the stage of investigation during which the potential environmental effects and their significance due to plant construction, operation and maintenance, and abandonment should be identified. In this stage, candidate sites for the project are identified. Comparison of the environmental features of these candidate sites would help limit the number of sites under consideration.

The Site Selection Process should be considered as the preliminary study which brings to the fore all the major environmental impacts that should be examined in detail in the preparation of the EIS in the Site Evaluation Process. It is the responsibility of the Initiator to identify from a spectrum of environmental effects the ones that are considered most important and may affect the acceptability of the candidate sites.

The following list indicates the major categories of factors to be considered in the Site Selection Process:

Air	- existing quality, dispersion characteristics, fogging and icing
Water	- availability, quality, present and potential uses, rights, plans (includes surface and groundwater)
Land	- availability, geology, present and potential uses, rights, plans
Biological	- ecosystem sensitivity, radiological sensitivity (includes land and water)
Social	- health, anticipated effects on human life style, national and international impact, safety
Noise	- potential
Hazards (to plant)	- aircraft, storm, flood, geologic stability, seismic action, sabotage

This list of environmental factors is intended to be general and broad, so as to allow the Initiator the flexibility to address the environmental concerns which are important. For example, in considering the availability of water, a large number of candidate sites may be eliminated, if once-through cooling were to be used.

At the same time, the Initiator conducting the Site Selection Process should be aware of all the detailed aspects which will be required during the Site Evaluation Process. For this purpose, a suggested list of the "Items for Consideration in the Environmental Assessment of Nuclear Power Development" follows as Appendix A.

It is stressed that regular discussions should be held with officials of the appropriate environmental agencies to review and determine the direction and extent of studies in progress.

It may be possible that in certain projects such discussions during the course of the study could help the proponent and the Initiator identify issues and gaps not initially anticipated. In cases where additions or revisions to this general guideline document are deemed necessary, these changes should be discussed and resolved jointly with the Chairman of the Environmental Assessment Panel.

In some cases, the use of available sources of information will be sufficient for the Site Selection Process. Should knowledge or information gaps exist, their effects on the decision evolved through the Site Selection Process should be assessed.

1.3. Format of the Site Selection Document

The Site Selection Document should include the following sections:

1. Overview Summary
2. The Project Setting
3. The Proposal(s)
4. Identification of Candidate Sites (In accordance with factors described in Sections 6 to 9)
5. Comparison of Candidate Sites.

The section headings of this list are explained as follows

2. OVERVIEW SUMMARY

It is intended that this part of the report be prepared in such a way that it can be extracted directly for publication by the media, (if this is required), and used by senior executives for a rapid appraisal of the situation. The important findings of the report, therefore, should be summarized under this heading in terms understandable to the general public and by those unfamiliar with scientific usage.

The overview summary should contain a description of the project, a description of the probable major environmental impacts, the ameliorating and mitigating measures, and a documentation of the significance of the residual impacts. The Initiator should include in the summary any aspect peculiar to the type of development that may be of broad public concern. The summary should also clearly identify data gaps or knowledge deficiencies and the limitations they have imposed on the Site Selection Process.

3. THE PROJECT SETTING

3.1. Declaration

The Initiator and/or proponent should be identified and should accept responsibility for statements, judgements and commitments in the Site Selection Document.

3.2. The Need

The Initiator should explain the rationale of the need for the power development project. Description of the need should not be restricted strictly to quantitative aspects but should include all pertinent parameters.

This selection should include forecast demand curves, description of existing and historic demands, interrelationships between different and competing ways of fulfilling the demand, and location of the demand. Other characteristics of the need should be clearly outlined including the timing aspects.

3.3. Alternatives

The Initiator should present and discuss the benefits and disbenefits in terms of environmental and socio-economic factors of each feasible alternative in relation to other alternatives for the proposed development. Cancellation of the project should be considered as one alternative. Reasons for rejecting alternatives should be given. Extension of existing facilities, reduced new development, or a combination of both should be considered as alternatives.

3.4. Associated Projects

All projects which may be affected by the proposal and which in turn may cause environmental concern should be identified, their interrelationships discussed and the environmental concerns defined whether or not they fall within the jurisdiction of the Initiator and/or proponent. Broad, long-term, probable spin-off developments should also be discussed in terms of their environmental effects.

4. THE PROPOSAL(S)

All outstanding alternatives not discarded in 3.3. above should be discussed. The following factors common to all system alternatives should be discussed first:

4.1. General Layout

4.2. Construction Details

4.3. Operation and Maintenance

4.4. Abandonment and Rehabilitation

to be followed by a description of the factors peculiar to individual system alternatives.

All pertinent physical features of the proposal should be defined. Typical items to be considered can be found under Project Description in Appendix A.

5. IDENTIFICATION OF CANDIDATE SITES

Any decisions regarding the number and locations of candidate sites must be justified.

All sites will be identified according to factors described in Sections 6 to 9 below.

In addition, the location of the proposed project in terms of its geographic settings at these sites should be defined.

The information should be presented on maps of sufficiently large scale, to show:

a) topography (with contours), landforms, surficial geology, bedrock geology, major soil types and indication of presence or absence of permafrost.

b) recognized or anticipated areas of instability (landslides, mudflows, snowslides, earthquake zones, etc.)

c) special, sensitive, or unique geological or landform features.

6. DESCRIPTION OF EXISTING ENVIRONMENT AND RESOURCE USE

This section should describe the environment as it exists prior to project development with emphasis being placed on the environmental components that are of particular importance. It should consider both the immediate environment and ancillary areas that may be affected. A qualitative and quantitative description of present resource use in the areas concerned should also be included, as well as the identification of knowledge gaps where these exist. It is suggested that the description be developed in terms of the headings below. Appendix A provides a suggested list of the factors which can be considered under these headings where applicable.

Air
Land
Water
Biology (flora, fauna)
Social
Land and Resource Use.

7. ENVIRONMENTAL IMPACTS

The discussion should describe and compare the potential environmental impacts of the selected system alternatives for each candidate site.

The assessment of short and long term potential environmental impacts should be made on the basis of information collated from existing sources and on information collected in the field to supplement what is available. The effect(s) of knowledge gaps should be identified. Potential environmental impacts in the area to be affected by the proposed development should be discussed in terms of existing environmental values, and should be identified in the design, construction, operation and maintenance and abandonment phases of the project. In situations where Provinces and the Department of Indian and Northern Affairs are involved, they may request the inclusion of socio-economic values. These values may be considered as international, national, regional, local or site-specific. Information that may be required to carry out a satisfactory site selection shall include, but shall not necessarily be restricted to, topics outlined in this section. Options and measures available to avoid, minimize or mitigate harmful effects and to enhance beneficial effects are to be investigated and discussed under each topic. Impacts identified as major (more important) are to be discussed in detail in section 8.

The Initiator should consider and discuss all potential environmental impacts in the area to be affected by the proposed development in terms of the headings identified in section 4, and other factors considered identified to the particular task. Appendix A also provides a suggested list of the factors which can be included in this consideration where applicable.

Summary

- Concerns raised and options and measures available to alleviate those concerns.
- Major concerns for detailed discussion in the following section should be summarized at this time.

8. MAJOR IMPACTS AND MITIGATING MEASURES

In this section the Initiator should identify and discuss the major environmental impacts which may result from the development. Major impacts are identified as those of long and short term that disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of, or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health of segments of the human inhabitants (deleterious as well as beneficial

impacts); or significantly change the environmental options.

The following should be outlined as part of the discussion of each major environmental impact identified:

- description of the environmental impact in terms of the above;
- mitigating or ameliorating measures that can eliminate or minimize deleterious impacts. These might include location change, design changes, changes in the scheduling of associated activities, enhancement measures to supplement biotic resources lost due to habitat destruction, or rehabilitation of impaired features. Other measures that can be considered are environmental education of construction and operational staff, and enhancement of beneficial impacts;
- description of contingency plans for major accidents, and assessment of consequences;
- plans for surveillance and monitoring of environmental effects.

9. RESIDUAL IMPACTS

The environmental impacts that will remain after all practical mitigating measures have been incorporated into the alternative development proposals should be discussed in this section in terms of:

- nature, extent and duration of all such impacts in the environmental and socio-economic spheres and in the international, national, regional, local and site specific context;
- the environmental significance of the potential residual impacts.

10. COMPARISON OF CANDIDATE SITES

In this section, the candidate sites will be compared with respect to their environmental characteristics detailed in Section 5 above. The sites will be ranked according to their project suitability from the point of view of causing minimum undesirable effects on the environment.

11. ANNEXES

To be included as Annexes in the Site Selection Document:

11.1. An annotated list of references cited.

11.2. Copies of reports developed from studies associated with the evaluation.

APPENDIX A

ITEMS FOR CONSIDERATION IN THE ENVIRONMENTAL ASSESSMENT OF NUCLEAR POWER GENERATING STATIONS

APPENDIX A

ITEMS FOR CONSIDERATION IN THE ENVIRONMENTAL ASSESSMENT OF NUCLEAR POWER GENERATING STATIONS

1. PROJECT DESCRIPTION

(Project characteristics and requirements are listed in this Section. The environmental impacts of the project are indicated in Sections 2 to 7 below.)

1.1. GENERAL

	A	B	C*
. project need	X		
. type(s) of generating station (why chosen?), initial size, phasing, ultimately desired size, generation unit size	X		
. intended date for 'in service' (first unit)	X		
. economics			
. transmission corridor, requirements for egress	X		
. power plant land requirement, exclusion radius	X		
. cooling system (type chosen, alternatives considered)	X		
- if cooling tower: dimensions and design, operational characteristics, such as, wet or dry, mechanical or natural draft, quantity and quality of water requirements and releases.			
- if once-through cooling: characteristics of intake, screen-houses and outfalls, quantity and quality of water requirement and discharge, operational characteristics, alternative designs considered.			
- other			
. sources of emergency and surface water supply	X		
. uses of waste heat and nuclear steam	X		
. additional servicing facilities (railways, docks, roads, etc.)	X		

---

* A - documentation/description/information required; where applicable, particularly when the designated item refers to part of the natural and social environment, the documentation should relate to the ambient condition.

B - predict impact on the item indicated due to plant construction.

C - predict impact on the item indicated due to plant operation and/or due to the existence of the power plant complex; or predict the impact of the indicated parameter on the power plant complex and plant operation; assessment should include local-and large-scale as well as short-and long term effects.

	A	B	C
1.1. General (continued)			
. people	X		
- quantity of labour force required, for construction and operation of plant			
- qualifications (i.e. breakdown numbers into skilled, unskilled, temporary, permanent, etc.)			
- need for new facilities such as, servicing and utilities, community service, etc.			
- relocation requirements for any people or enterprises likely to be displaced by the project.			
. alternative sites considered	X		
. proposed remedial measures to mitigate or eliminate the undesirable environmental and social effects identified in this assessment	X		
. proposed pre-and post-operational monitoring programs	X		
. possible hazards and safety measures	X		
. rehabilitation plan for the plant	X		
. other	X		
1.2. Fuel			
. type, quantities and locations of sources for mining, milling and refining	X		
. handling and transportation procedures	X		
. temperature limitations	X		
. possible hazards and safety measures	X		
. storage	X		
. likely wastes	X		
. handling and storage of spent materials	X		
. plans for spent fuel	X		
. other			

	A	B	C
1.3. Construction			
. timing for each phase commencing with site clearing, excavation, etc.	X		
. living areas	X		
. storage areas	X		
. phasing - of additions to station capacity	X		
. special equipment	X		
. procedures of	X		
- clearing			
- excavation and disposal			
- fill - removal/supply (including sources and approximate quantities and requirements, if any, for dewatering)			
- shoreline fill (materials, sources, methods)			
- construction			
- restoration			
. water supply and utilization	X		
. waste removal and treatment	X		
. other			
1.4. Operating Procedures			
. noise - give criteria, monitoring procedures	X		
. complete testing, analysis and removal of chemical and radiological wastes (including condenser biocides, boiler blowdowns, water treatment wastes, radioactive wastes, etc.)	X		
. listing of any and all other likely contaminants having potential for health and environmental hazards	X		
. treatment proposals and expected levels of discharge related to possible fate in the ecosystem	X		
. water supply and utilization	X		

	A	B	C
1.4. Operating Procedures (continued)			
. emergencies - contingency plans	X		
. temperature (cooling water) controls	X		
. fish control - entrainment, entrapment, disposal of dead fish and algae	X		
. reporting mechanisms (to whom, and when?): day to day, emergencies, emissions	X		
. radioactive and non-radioactive control and monitoring	X		
- inside and outside of plant			
- off plant operations, emissions			
. radiation control and monitoring, and contingency procedures	X		
. operational shutdown procedures	X		
. other			
1.5. Off-Site			
. construction	X		
- methods of transport, including loads and types			
- noise, dust			
- waste removal			
- source of bulk aggregate			
. work force	X		
- community impacts			
- number of new residences and worker accommodation required			
- changes in servicing (sewage, hospitals, police, etc.)			
. operation	X		
- upgrading of facilities			
- servicing			
. other			

	A	B	C
2. AIR			
2.1. Quality			
. air quality on and off-site; background contaminants; sampling methods	X		X
. contaminants from the power plant	X		X
. other			
2.2. Dispersion Climatology			
. wind speeds (direction and frequencies on a monthly or seasonal and annual basis)	X		X
. inversions (frequencies, heights, intensities and durations on a monthly, or seasonal and annual basis)	X		X
. frequency distributions of mixing heights and mixing layer wind speeds on a monthly or seasonal and annual basis	X		X
. atmospheric stability (frequency distribution of Pasquill-Turner Type on a monthly or seasonal and annual basis)	X		X
. precipitation (type, amount, duration and frequency by direction on a monthly or seasonal and annual basis)	X		X
. effects of topography	X		X
. natural heat flux and number of locations of other significant heat sources	X		X
. atmospheric dispersion of plant releases - under all possible conditions			X
. interaction with other sources			X
. local climatic effects			X
. other			
2.3. Fogging and Icing			
. fog (frequency and duration on a monthly or seasonal and annual basis, including ice fog where applicable)	X		X
. icing (frequency and duration on a monthly or seasonal and annual basis)	X		X
. on major transportation routes	X		
. effects on adjacent land use			

	A	B	C
3. LAND (Non-biological)			
3.1. Geological Characteristics			
. topography	X		
. stratigraphy, geomorphology	X		
. weathering, geochemistry	X		
. unique or significant geologic features, fossils and deposits	X		
. potential effects of faulting	X		X
. effect of accelerated weathering		X	X
. effect on unique features and deposits		X	X
. other			
3.2. Soils and Stability			
. soil types and overburden, slopes, stability, rock fall	X		
. erodibility, permeability, and potential of subsidence	X	X	X
. disposal of excess soil material		X	
. effects on stability (i.e. steep banks, dust, erosion of shoreline, etc.)		X	X
. effects on surrounding agricultural lands		X	X
. effects on facility due to subsidence			X
. other			
3.3. Seismic Action			
. local and distant seismic activity	X		
. public safety aspects	X		X
. effect of historical activity on site to date	X		
. potential for contamination release due to structural damage			X
. hazard presented to intake and/or discharge system			X
. other			

	A	B	C
4. WATER (Non-biological)			
4.1. General			
. treaties, rights, jurisdictions, policies, priorities and existing and proposed water uses	X	X	X
. flood management plans and policies	X	X	X
. other			
4.2. Physical			
. bathymetry, bottom sediments (with respect to construction and location of cooling water intake and outfall, etc.)	X		
. limnological and/or oceanographic characteristics including thermal and circulation regime, waves, seiches, set-ups, tides and tsunamis	X		X
. river hydraulics and hydrology	X	X	X
. littoral drift; erosion and/or sedimentation	X	X	X
. groundwater; levels, recharge-discharge, nature and distribution of aquifers	X	X	X
. cooling water discharge and other plant effluents	X		X
. plume characteristics (to be predicted by physical and mathematic models, for anticipated field conditions) and temperature predictions			X
. interaction with (other) plumes and synergistic effects			X
. evaporative losses	X		X
. effect of partial and complete plant shut-downs			X
. land drainage	X	X	X
. lakeshore/river ice	X		X
. other			

	A	B	C
4.3. Chemical			
. water quality of receiving waters (solids, nutrients, trace contaminants, etc.).	X	X	X
. quality of effluents from plant, including levels of radioactivity, pathways of concentration, etc.	X		
. effects on surface and ground water quality parameters		X	X
. potential for radioactive and/or toxic material concentration, effects of such concentration			X
. effects of antifoulants used in the cooling system			X
. other			

	A	B	C
5. BIOLOGICAL (General)			
5.1. General			
. documentation and evaluation of biologic communities* (species, seasonal population levels, movements, reproduction, trophic structure, population dynamics, pertinent factors and relationships, etc.)	X	X	X
. potential for damage on-and off-site due to plant emissions, radioactive, and otherwise			X
. sensitive components of the ecosystem, inter-relationships, adaptability	X	X	X
. important species and reproductive requirements	X	X	X
. migration	X	X	X
. population dynamics, carrying capacity	X	X	X
. significance for human interests	X	X	X
. ecosystem stability	X	X	X
. rare and endangered species	X	X	X
. habitats, breeding areas, range feeding areas and food sources	X	X	X
. displacement, disruption, and elimination of habitats		X	X
. bioconcentration		X	X
. short-and long-term effects		X	X

* Aquatic communities consist of:aquatic vegetation, macrophytes, periphytes, planktons, micro-organisms, reptiles, amphibians, fish, water fowl and mammals. Terrestrial communities consist of: mammals, birds, reptiles, amphibians, invertebrates and all surface and subsurface vegetation and micro-organisms.

	A	B	C
5.2. Terrestrial Biology (specific concerns)			
. species territories, populations	X	X	X
. breeding habitats, staging areas	X	X	X
. effects on habitats caused by noise, storage areas, temporary camps, people access, alteration of siltation - erosion pattern, water levels, current pattern		X	X
. effects of power transmission		X	X
5.3. Aquatic Biology (specific concerns)			
. effects of water quality changes and heated discharge on aquatic ecosystem		X	X
. effect of landfill on aquatic ecosystem		X	X
. fish impingement at cooling water intake (includes water withdrawal for heat tempering if this is used)			X
. entrainment of biologic organisms by water withdrawal systems (includes cooling water, water withdrawal for heat tempering and other purposes); evaluate damage due to both thermal and mechanical stresses			X
. total damage in relation to the total biological resource of the receiving water body (Canadian resources in International Waters)			X
. effects of alteration in erosion siltation pattern, water levels, currents		X	X
. other			

	A	B	C
6. SOCIAL, COMMUNITY AND LAND-USE			
6.1. Health and Safety			
. Federal and Provincial criteria	X		
. normal conditions	X		
. effect of plant on ambient conditions through water and atmospheric releases and land disposal practices		X	X
. safety measures to minimize hazards (including transportation and handling of hazardous materials, fail-safe systems, fire protection, security against sabotage, protection against damage from natural catastrophies)	X	X	X
. contingency plans in the case of plant accident or spill	X		X
. other			
6.2. Communities			
. population distribution	X	X	X
. labour force	X	X	X
. local industries	X	X	X
. housing and servicing availabilities	X	X	X
. wage structures	X	X	X
. transportation, education, medical and other community services	X	X	X
. other			
6.3. Land Use Planning			
. Governmental Plans and Programs (including federal, regional, provincial and municipal)	X	X	X
. local official plans and zoning by-laws	X	X	X
. federal lands and reserves, and federal treaties	X	X	X
. rights on lands	X	X	X
. areas of special status (e.g. native land reserves, culturally sacred areas, cemeteries) and areas of potential special status (e.g. proposed ecological reserves)	X	X	X

	A	B	C
6.3. Land Use Planning (continued)			
. existing development and conservation plans and programs on coastal zone and watershed management etc.	X	X	X
. other			
6.4. Agricultural Land-use			
. classes of agricultural land, and uses, acreages, trends, etc. (e.g. crops, dairy, beef, orchard, etc.)	X		
. land capability for agriculture	X		X
. agricultural crops/programs	X		X
. toxic effects			X
. effects on labour force		X	X
. effects on agricultural systems, production, etc.			X
6.5. Non-Agricultural Land-use			
. all existing and potential land-use within area of potential effect	X		X
. mineral resources: minerals, oil and gas, and quarries	X		X
. forest resources such as: seed production, shelter or other protective belts; forest management policies and programs	X		X
. recreational uses	X	X	X
. near-and far-field effects on forestry due to air contaminants			X
. urban land-use patterns	X	X	X
. aesthetics	X	X	X
. historical and archaeological areas - all historical and archaeological areas that may be affected by plant site, transmission lines, roads, plant operation, etc.	X	X	X
. other			

	A	B	C
7. NOISE			
. allowable criteria	X		
. local by-laws	X		
. potential from plant	X		
. effects on urban and agricultural land-uses		X	X
. effects on biologic communities		X	X

G U I D E L I N E S

to prepare an

INITIAL ENVIRONMENTAL EVALUATION

for

A I R P O R T S

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

AIRPORTS

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1. OVERVIEW SUMMARY

The overview summary should consolidate the important findings of the report and should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media (if this is required), or for use by senior executives requiring a quick appraisal of the situation.

The overview summary should briefly describe the project, the probable major environmental impacts, the ameliorating and mitigating measures to be implemented by the assessor, and the significance of the residual unmitigated environmental impacts. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. PROJECT SETTING

2.1. Declaration

The initiator and/or proponent should be identified and their acceptance of responsibility for statements and judgments in the Initial Environmental Evaluation should be acknowledged.

2.2. The Need

a. State whether this replaces or increases existing facilities or provides new facilities where none existed previously and describe the relationship of this airport with other airport and transport facilities in the area.

b. State whether requirement is immediate or future and document requirement with air traffic densities and frequencies and projections of future requirements; estimate the time period this airport is expected to serve and briefly describe what extention, additions or new facilities will likely be required after that time.

2.3. Alternatives

a. Identify other sites which were or are being considered. Discuss the advantages and disadvantages of each with special reference to the environmental and socio-economic implications. (Reports identifying the need for the airport or airport expansion should be referenced in ANNEX 1.

b. Discuss the relative advantages and disadvantages of continuing with or expanding existing airport facilities.

2.4. Associated Projects

a. All projects which may be affected by the proposed airport and which in turn may cause environmental concerns, should be identified, their inter-relationship discussed, and the environmental concerns identified whether or not they fall within the jurisdiction of the Initiator and/or proponent.

b. Broad, long term, probable spin-off developments should also be discussed in terms of environmental effects.

c. Outline how the airport fits into municipal, provincial and federal long range plans for the area.

3. THE PROPOSALS

All outstanding alternatives not discarded in 2.3. above should be discussed under each heading. The factors common to all alternatives may be discussed first, followed by a description of the factors peculiar to individual alternatives.

3.1. General Layout

a. The precise location of the airport, maps, air photos, etc. should be provided.

b. Plans of several scales should be provided to identify the airport with relationship to surrounding communities, recreation areas, natural parks, etc. and to identify the location of fuel storage tanks, waste reservoirs, de-icing locations, snow removal disposal areas, potable water facilities, etc.

c. Access routes (road or rail), freight storage and loading areas, passenger facilities, should be identified.

d. The above should indicate immediate requirements together with proposed locations in the event of future expansion.

3.2. Construction

The following activities should be discussed giving time-tables for starting and finishing each phase and outlining methods and procedures to be followed:

a. Pre-Construction Phase

- tree cutting and stumping
- blasting and excavating
- stripping and dredging
- filling and grading
- water supply sources and waste water disposal areas.

b. Construction Phase

- location, duration, size, and services of construction camps
- hauling
- asphalt operations
- concrete operations
- erecting and finishing buildings

c. Rehabilitation of Disturbed Areas

- sodding and landscaping
- disposal and waste cleanup
- location and restoration proposals for temporary access routes, fill and gravel sources

3.3. Operation and Maintenance

a. The following items should be detailed:

- the important timing and other commissioning details of the proposal;
- water supply and waste water disposal requirements, in terms of location and volume;

- the volume, timing, composition and other details of expected air emissions, water effluents, noise and solid waste disposal (specific reference should be made to the handling and disposal of waste originating from non-domestic flights in accordance with Department of Agriculture, National Health and Welfare or other regulations);
- the aesthetic features of the project;
- any interruption to natural resources such as river flows, air quality, ground water regimes, growth of flora, lake levels, etc. with cost estimates in terms of time, space and magnitude;
- changes in surface traffic patterns, e.g. type, volume, destination and frequency, due to operations.

3.4. Abandonment

a. Plans for abandonment should be detailed where pertinent.

4. DESCRIPTION OF EXISTING ENVIRONMENT AND RESOURCE USE

This section should describe the environment as it exists, in the airport area including the area to be affected by flight patterns, before the proposed airport or expansion of facilities, with emphasis on the environmental components identified below. A qualitative and quantitative description of present resource use in the areas concerned should also be included as well as the identification of knowledge gaps where these are known. Where appropriate the information may be presented in map form.

4.1. Land

a. Land suitability and capability factors including capabilities for agriculture, forestry, wildlife, fisheries and recreation.

b. Important landforms, bedrock formations, surficial deposits, mineral resources, soils with special reference to their suitability for an airport use, erosion and slumping characteristics.

c. Ownership and use of adjacent land (public, private or special status, such as national, provincial, municipal parks, bird or animal sanctuaries, reservations, etc.).

d. Areas of historical or archaeological interest.

e. Traditional land use patterns (native hunting, trapping, fishing, and areas of religious significance).

f. Present land uses and projected future uses in terms of industrial, commercial, residential, recreational and agricultural interests.

g. Projected urban and industrial and commercial development expected as a result of the airport.

h. Status of regional plans (projected changes, supply and demand for land and water).

4.2. Hydrology and Water

a. Locations of streams, marshes, lakes, reservoirs, and other water bodies

b. Locations of dams and other water resource structures

c. Description of streamflow regimes with extremes including floods and droughts, and watersheds

d. Description of groundwater systems, water table, aquifers, etc.

e. Description of water use (recreational, industrial, commercial, municipal, etc.

4.3. Meteorology and Air Quality

a. Wind frequencies by direction and speed with durations of critical low speeds, turbulence

b. Temperature, means and extremes

c. Temperature inversion frequencies and depths

d. Precipitation, means and extremes

e. Evapotranspiration

f. Snow accumulation

g. Fog occurrence frequencies

h. Baseline levels of particulates, sulphur compounds, nitrates, hydrocarbons, carbon monoxide.

4.4. Ambient Noise

a. Baseline levels and directional biases for airport take-off and approach areas where levels may be significantly increased.

4.5. Plant Life

a. Terrestrial, intertidal and marine plant, susceptibility to airport activities, rarity of any species.

b. Plant communities, their relative abundance and importance to fauna as habitat and food sources.

4.6. Fish and Wildlife

a. Species and populations of fish, amphibians, reptiles, birds, and mammals whose habitats are to be affected by the airport development. Special attention should be given to rare or endangered species, and species of commercial, scientific or recreational importance.

b. Special note should be made to nesting or spawning areas, nursing areas, staging areas, wintering areas, migratory paths, etc.

4.7. People

a. Distribution and characteristics of the human population (life patterns, communities, employment, public facilities, housing). Cultural, social, and economic setting of the general area.

5. ENVIRONMENTAL IMPACTS

The discussion should describe and compare the expected environmental impacts of the selected alternatives.

The assessment of short and long term potential environmental impacts should be made on the basis of information from existing sources supplemented by field investigations where necessary. Potential environmental impacts should be compared to existing environmental values and baseline data where available. Plans for surveillance and monitoring of environmental effects should also be detailed. Options to mitigate harmful and to enhance beneficial effects are to be discussed.

5.1. The activities identified in 5.2 and 5.3 may each have an impact on one or more of the primary elements indicated below:

a. Land

- salinity; acidity; erosion; agriculture, and other land uses; aesthetics.

b. Water

- integrity of water table; changes in runoff patterns due to large concrete areas and snow removal activities; quality, chemical and particulate; quantity, stream flow location and volume; riparian rights and downstream effects; aesthetics.

c. Air Quality

- airborne particulates; hydrocarbons, carbon monoxide; nitrogen oxides; oxidants; sulphur oxides.

d. Ambient Noise

- due to airport and flight patterns.

e. Surface Vehicle Traffic Patterns

- changes in volume and frequencies due to the construction and/or operation of the airport.

5.2. Secondary environmental elements may be affected directly by activities in 5.2 and 5.3 or indirectly through changes in the primary elements listed in 7.1 above.

a. Plants and Animals

- mammals, residential and migratory; birds, residential and migratory; reptiles, invertebrates; trees and shrubs; grasses.
- changes in bird population densities resulting from increasing the attractiveness of the area to various species.

b. Aquatic Life

- phytoplankton; micro-organismes; amphibians, invertebrates; fish.

c. Human Life

- residential, noise, odors, corrosion, etc.; recreational, hunting, fishing , etc.; occupational, hunting, fishing, farming, etc.; changes in life style, health effects.

5.3. Summary

a. Lesser concerns together with options and measures available to alleviate these concerns should be outlined.

b. Major concerns should be summarised here and identified for detailed discussion in the following section.

6. MAJOR IMPACTS AND MITIGATING MEASURES

The Initiator should identify and discuss herein, those impacts of short or long duration that enhance, disrupt, impair or destroy, existing features, conditions or processes in the natural environment, or cause enhancement of, or conflict with, established, traditional or historical land use and ways of life; or affect the livelihood or health of segments of the human population (deleterious as well as beneficial impacts); or significantly change the environmental options.

The measures which will be taken to mitigate undesirable, and/or enhance desirable environmental impacts should be discussed as each impact is identified.

a. Safety

- increasing the attractiveness of the area to avian species may in turn result in the development of a flight hazard to the aircraft, and consequently to both passengers and to residents on the ground in the flight path.

b. Land

- loss of land for agriculture
- increase of economic activity surrounding the airport which may change life styles and economic activities.

c. Water

- changes and interruptions in stream flow
- relocation of streams
- changes in runoff patterns
- changes in water quality due to chemical additions from de-icing aircraft salting and sanding runways
- stream pollution due to stripping and dredging and construction erosion
- sewage and solid waste disposal

d. Air Quality

- increases in carbon monoxide, sulphur oxides and particulate matter

e. Ambient Noise

- noise level increases due to aircraft runup and approach and takeoff patterns

f. Surface Vehicle Traffic Patterns

- established modes - changes to density and routing

g. Aquatic Life

- effects resulting from changes in water quality and regime

h. Human Life

- residential life affected by changes in noise levels due to aircraft and motor vehicle traffic
- life styles altered due to changes in work patterns, loss of agricultural land, dislocation of people and their friends
- in the case of northern airports, disruption of hunting and fishing practices of native people.

7. RESIDUAL IMPACTS

The environmental impacts that will remain after all practical mitigating measures have been incorporated into the alternative development proposals should be discussed in this section in terms of:

- nature, extent and duration of all such impacts in the environmental and socio-economic spheres and in the international, national, regional, local and site specific context.
- the environmental significance of the potential residual impacts
- limitations imposed on the evaluation due to data gaps, knowledge deficiencies, or other restrictions.

8. ANNEXES

8.1. An annotated list of references cited

8.2. Copies of reports developed from studies associated with the evaluation.

G U I D E L I N E S

to prepare an

INITIAL ENVIRONMENTAL EVALUATION

for

P O R T S

(Sea or Fresh Water)

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

PORTS

(Sea or Fresh Water)

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1. OVERVIEW SUMMARY

The overview summary should consolidate the important findings of the report and should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media (if this is required), or for use by senior executives requiring a quick appraisal of the situation.

The overview summary should briefly describe the project, the probable major environmental impacts, the ameliorating and mitigating measures to be implemented by the assessor, and the significance of the residual unmitigated environmental impacts. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. THE PROJECT SETTING

2.1. Declaration:

The Initiator and/or proponent should be identified, and should take responsibility for statements and judgements in the IEE.

2.2. The Need

The Initiator should define the rationale for the project including a discussion of forecast demand curves and their underlying assumptions. A statement of existing and historic demands, interrelationships between different and competing ways of fulfilling the demand, including alternate policies or adjustment of present policies should also be included in this section.

2.3. Alternatives

The Initiator should discuss the benefits and disbenefits in terms of environmental and socio-economic factors for each feasible alternative in relation to other alternatives for the proposed development. Extension of existing facilities, where they exist, alternate policies, and cancellation of the project should be considered as alternatives. The examination of alternatives should include alternate sites, as well as alternate configurations of site-specific proposals.

2.4. Associated Projects

All projects and activities associated with the proposed development which, in turn, may cause environmental concern, should be identified. The interrelationships and environmental concerns defined should be discussed whether or not they fall within the jurisdiction of the Initiator and/or proponent.
Broad, long-term, probable spin-off developments, should also be discussed in terms of their environmental effects.

3. THE PROPOSAL(S)

The alternatives not discarded in 2.3. above should be discussed under each of the following headings. The factors common to all alternatives may be discussed first, followed by a description of the factors peculiar to individual alternatives.

3.1. General Layout

a) The location of the proposal(s) in terms of geographic setting should be presented. If practical, specific map sizes should be utilized which illustrate the large and small-scale features. Aerial photographs (at high and low water levels if tidal amplitude is large) are particularly illustrative.

b) All pertinent physical features of the proposal should be defined including future expansion plans.

c) The type and location of traffic and utility corridors should be indicated.

d) Pre-development activity involving clearing, trenching, drilling and seismic activities should be identified.

3.2. Construction Details

The following items should be outlined where applicable:

a) the method and timing of construction for each part of the proposal;

b) dredging requirements; fill, berths, turning basins; dredge spoil disposal;

c) the place and method of acquisition of local building materials; for example, borrow pits, quarries, water supply, waste water disposal, and any other requirements of the proposed type of development;

d) location of new access roads, and use of existing roads and other transportation facilities;

e) location, duration, size and services of construction camps;

f) interruption to or alteration of natural processes such as river flows, lake levels, tidal exchange, ocean currents, ice regimes and shoreline processes such as erosion and accretion in terms of timing and other pertinent variables;

g) any effluents, emissions, noise or aesthetic factors caused by the construction.

3.3. Operation and Maintenance

The following items should be detailed:

a) the important timing and other commissioning details of the proposal; (estimated life of project);

b) the nature and volumes of the materials or commodities anticipated to be stored, sorted, or inbound/outbound at the port;

c) the size and classification of vessels utilizing the facility;

d) the volume, timing, composition, and other details of expected air emissions, effluents, noise and solid waste disposal;

e) estimated spill frequencies based on examination of similar facilities;

f) any interruption to natural processes such as river flows, air movements, ground water regimes, lake levels, ice regimes, tidal exchange and ocean currents caused by the operation in terms of timing, space and magnitude;

g) the water borne and terrestrial traffic flow volumes, initial and expected maximum.

h) water supply, in terms of location and volume;

i) anticipated maintenance dredging requirements and disposal procedure;

j) plans for surveillance and monitoring of environmental effects;

k) contingency plans, supporting physical resources and training programs which are proposed to deal with environmental emergencies;

3.4. Abandonment

Plans for abandonment/rehabilitation should be detailed, where pertinent.

4. EXISTING ENVIRONMENTAL FEATURES AND NATURAL RESOURCES

This section should describe the environment and natural resources as they exist prior to project development. The relationship of the project to the total environment surrounding it should be addressed. It should consider both the immediate project area and areas that may be affected by accidents and other contingencies, associated urban and industrial developments, utility corridors and transportation routes. A qualitative and quantitative description of present resource use in the areas concerned should also be included. It is important that knowledge gaps, where these exist, be clearly identified.

It is suggested that the description be developed under the following headings, and include a discussion of pertinent physical constraints upon development.

4.1. Hydrography and Hydrology

There should be accurate large-scale navigational chart and publication coverage for the terminal area, turning basins, mooring and anchoring areas, and the approaches from the open ocean, lake or river to the terminal. It is emphasized that the special needs of large, deep-draft vessels may require more detailed hydrographic information such as limiting depths to 0.1 M, and precise tidal and/or water level information, either in the form of real time readings or accurate predictions.

Special attention should be placed on those bathymetric and physical features which affect the safety of navigation, such as the existence of shoals and rocks, the characteristics of congested areas, the nature of the sea, river or lake bed, and the location of aids to navigation, especially in areas where adverse weather and oceanographic conditions may make navigation difficult. A discussion of ice regimes should be included, if appropriate.

4.2. Physical Oceanography, Limnology and/or Fluviology

The tides and tidal currents should be well-documented in the terminal and traffic route areas. A reliable data base should involve at least two separate one-month observational periods involving periods of most significant physical phenomena. The information should include the results of harmonic analyses, residual currents, the shape of current ellipses and duration of slack. The magnitude and frequency of storm surges, if present, should be documented. The circulation patterns within the region should be synthesized from existing data. Particular attention should be focused upon the areas of strongest and most persistent flows. Average and significant wave heights, directional considerations, diffraction, reflection, refraction and resonance, should be indicated. Estimates of seasonal variations and extreme conditions should be included.

The statement of physical oceanographic, limnological or fluviological conditions and processes, should also include available information on vertical salinity, temperature (density) and dissolved oxygen distribution, mixing characteristics, dispersion rates and areas of convergence, and the frequency and amplitude of seiche activity in the area where applicable.

4.3. Meteorological Conditions

Discussion of meteorological conditions should focus upon those factors which either singly or in combination have a direct bearing on the planning, construction or operation of the facility in terms of preferred location and layout, efficiency, safety and dispersal of effluents or emissions. Examples would include monthly and diurnal variations in wind speed and direction, local wind structure and the percentage occurrence of winds exceeding certain levels (i.e. 30 and 50 kts).

Similarly, visibility, including the frequencies of visibilities below specified limits (i.e., 1/2 mile, 1/8 mile, etc.) should be included along with information on the duration of such events. Statistics on combined high wind-low visibility events should be developed.

Other variables of interest may include short-duration, high-intensity rainfalls and snowfalls. In areas where it is relevant, information should be presented on the occurrence of ice, ice accretion, wind and ice loading, and ice flows or bergs.

In each case, the pertinence of the data with respect to the planning, construction and/or operation of the facility should be discussed. The observational network and predictive capability, as related to the more important meteorological variables should be identified.

4.4. Chemical Oceanography, Limnology, Fluviology and Water Quality

Chemical and bacteriological observations should include, if possible, in addition to salinity and dissolved oxygen noted in 4.2., suspended solids, total dissolved solids, biological oxygen demand, nitrate, nitrite, ammonia nitrogen, total dissolved phosphate, trace metals (cadmium, copper, iron, mercury, lead, zinc, chromium, nickel), chlorinated hydrocarbons, polychlorinated biphenols, detergents, fecal coliforms, pH, total alkalinity, and petroleum hydrocarbons.

A list of existing outfalls and degraded environments in the vicinity of the proposed port should be provided. Where it is possible, models of regional water quality should be developed to identify medium to long-term changes.

4.5. Geological Oceanography, Limnology and/or Fluviology

The local geology, including the sea, lake and/or river bottom, subsea, lake and/or river bottom, should be described, together with notes on unusual features, such as faulting and sea bed instability, and the potential for land slides, seismic activity and tsunamis. The rate and characterization of sedimentation from river runoff and littoral drift of suspended solids should be noted. Also important is the identification of areas where potential or

existing dissolved and particulate pollutants in the water columns could be absorbed, precipitated or flocculated and deposited on the sea, lake or river bottom. The coastal geomorphology and shoreline types in the port locality and the shores along the traffic route should be described.

4.6. Flora

The terrestrial, inter-tidal and aquatic plant communities, their relative abundance, their recreational and commercial values and their importance to fish and wildlife as habitat and sources of food should be described.

4.7. Fish and Wildlife

The species, abundance and distribution of invertebrates, fish, amphibians, reptiles, birds and mammals whose habitats will be affected by the proposed development should be documented. The main factors in the life cycles and ecology of the more important species, e.g. food chains, nesting or spawning areas, nursing areas, staging areas, wintering areas, and migration routes should be identified and their commercial, scientific and recreational and aesthetic values indicated.

4.8. People

The demographic, cultural and social characteristics of the human population and economic setting of the general area should be discussed. Administrative arrangements for the area affected by the proposed project should also be noted.

4.9. Land and Resource Use

Land capability, including areas of terrain sensitivity, such as soft sediments subject to settlement, or permafrost should be identified. Ownership of the proposed site(s) and adjacent land, present land and water use and projected regional changes of supply and demand should be discussed. Existing land use and policies, areas of existing or potential special use status, recreational and aesthetic resources of the area, including archaeological and historic land uses and sites should also be identified.

A discussion of potential areas subject to contamination and present utilization of proposed water traffic lanes by existing commercial transport vessels, fishing fleets and recreational craft should also be included in this section.

5. ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

The discussion should describe and compare the expected environmental impacts of the selected alternative sites and project designs including the associated activities and developments.

The assessment of short and long-term, direct and indirect, potential environmental impacts should be made on the basis of information collated from existing sources and discussed, but not necessarily restricted to, topics outlined in Section 4. The implications of knowledge gaps should be assessed in relation to the adequacy of the IEE.

Potential environmental impacts in the area to be affected by the proposed development should be discussed in terms of existing environmental characteristics and values, and should be identified for construction, operation and maintenance and abandonment phases of the project. In situations involving Provincial and Territorial Governments, there may be a request for inclusion of socio-economic values.

Information that may be required to carry out a satisfactory assessment shall include, but shall not necessarily be restricted to, topics outlined in this section. Options and measures available to avoid, minimize or mitigate harmful effects and to enhance beneficial effects are to be investigated and discussed under each topic. Steps in the process of determining mitigating measures should include an estimate of costs and benefits accruing from each potential area of mitigation. Plans for surveillance and monitoring of environmental effects should also be detailed. Impacts identified as major (more important) are to be discussed in detail in Section 6.

The Initiator should be asked to consider and discuss all potential environmental impacts in the area to be affected by the proposed development in terms of the headings identified in Section 4 and other factors considered pertinent to the particular task.

Summary

- Concerns raised and options and measures available to alleviate those concerns.

- Major concerns for detailed discussion in the following section should be summarized in this section.

6. MAJOR IMPACTS AND MITIGATING MEASURES

The guidelines should request the Initiator to identify and discuss the major environmental impacts which may result from the development. The guidelines should identify the probable environmental issues.

Major impacts are identified as those of long and short term that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of, or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health of segments of the human inhabitants (deleterious as well as beneficial impacts): or significantly change the environmental options.

The following should be outlined as part of the discussion of each major environmental impact for each alternative

- description of the environmental impact in terms of the above;

- mitigating or ameliorating measures that can eliminate or minimize deleterious impacts. These might include location changes, design changes, changes in the scheduling of associated activities, or rehabilitation of impaired features. Other measures that can be considered are environmental education of construction and operational staff, enhancement of beneficial impacts and contingency plans for major accidents.

- plans for surveillance and monitoring of environmental effects.

7. RESIDUAL IMPACTS

The environmental impacts that will remain after all practical mitigating measures have been incorporated into the alternative development proposals should be discussed in this section in terms of:

- nature and extent and duration of all such impacts in the environmental and socio-economic spheres and in the international, national, regional, local and site specific context;

- the environmental significance of the potential residual impacts.

8. ANNEXES

To be included as Annexes in the IEE;

8.1. An annotated list of references cited
8.2. Copies of reports developed from studies associated with the evaluation

G U I D E L I N E S

to prepare an

INITIAL ENVIRONMENTAL EVALUATION

for

M I N I N G D E V E L O P M E N T S

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

MINING DEVELOPMENTS

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1. OVERVIEW SUMMARY

The overview summary shoul consolidate the important findings of the report and should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media (if this is required) or for use by senior executives requiring a quick appraisal of the situation.

The overview summary should briefly describe the project, the probable major environmental impacts, the ameliorating and mitigating measures to be implemented by the assessor, and the significance of the residual unmitigated environmental impacts. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. PROJECT RATIONALE

2.1. Declaration

The Initiator and/or proponent shall identify himself and will take responsibility for statements and judgments in the I.E.E.

2.2. The Need

The rationale for the development should be outlined in terms of historic, present and projected demands. Economic and social benefits should be included, as well as details of how the project fits into federal, provincial, municipal or regional plans and programs.

2.3. Alternatives

The Initiator should list the feasible alternatives and discuss their relative social, economic and environmental benefits or disbenefits. This discussion should include alternatives for mining methods, tailings disposal, mill locations, mill processes, townsite locations and auxiliary service locations, as well as the many other possible alternatives for the general layout, construction, operation and abandonment phases of the project. Extension of existing facilities where they exist and cancellation of the project should be considered as alternatives.

2.4. Associated Projects

All projects which may be affected by the proposal and which, in turn, may cause environmental concern should be identified, their interrelationships discussed and the environmental concerns defined, whether or not they fall within the jurisdiction of the Initiator or proponent. Examples of types of associated projects would include transportation-related, community-related facilities, secondary processing. Long-term spinoffs should be discussed.

3. PROJECT PROPOSAL

The project should be described under each of the following headings, with common factors discussed first, followed by the factors peculiar to each alternative.

3.1. Development Concept

The history and plans for development should be described. A copy of the probable development schedule should be provided for the expected mine life span, along with location plans, site plans, relief maps, mine area map, present and proposed transportation routes, current population, townsite development plans and anticipated population.

3.2. Ore Body

A description of the ore body should summarize the most recent information on outline depth, width, extent of mineralization, elevation of mineral seams, mineralogical and radiological composition of the ore and waste rock.
Detailed plans for the development of the ore body need not be presented, but the areas which form the estimated reserves of the mine should be identified. Information should be provided about the acid generating potential of the ore and waste rock.

3.3. Mining

The proposed mining method and manner of waste rock disposal should be discussed. The extent and character of surface disturbance that is likely to occur should be described. The location of mine openings and mine discharges should also be described.

A mine water balance should be described and an estimate placed upon its form and composition at planned stages of mine development. The composition of the discharge effluent should be described.
Proposals for segregation and treatment of mine effluent should be discussed.
The types and estimated quantities of explosives to be used should be listed.

3.4. Processing

Conceptual flow diagrams for the crushing plant, mill, concentrator and roaster should be provided.
A process water balance and plans for recycling should be described. A similar reagent balance should also be developed. The volume, composition, frequency and duration of potential air emissions, liquid effluents, noise, solid wastes and method of handling recovered contaminants should be described. If smelting or refining processes are to be integrated with the mining and milling operation, the same description would be required.

3.5. Tailings Disposal

Methods of tailings disposal and potential sites in the operation of the system should be described.
Estimated characteristics of the tailings slurry should be provided, including flow rate and physical and chemical composition of the water and solid tailings fraction.
A prediction of the chemical, physical, toxicological and radiological characteristics of the final discharge and any anticipated seepages should be made. Proposals for treatment of tailings effluents should be discussed.

3.6. Mine Products

A description should be provided describing handling, storage of the final and intermediate products, as well as information concerning the type of transportation and shipping routes within Canada.

3.7. Miscellaneous Waste

Methods for treatment and disposal of garbage, sewage, and solid waste from the mine, townsite or camp, and transportation terminals and other mine-related developments should be submitted.

3.8. Supporting Industrial Services and Associated Projects

The Initiator should provide a description of the proposed power plant. If a power plant is not to be used, alternate sources of power should be described.
A description of associated projects such as marine terminals, roadways and airports should be provided. General site services should be described.

3.9. Hazardous Material Control

Plans for handling and storing petroleum products, such as fuels and lubricants; reagents, biocides; and any other hazardous materials should be provided.

3.10 Construction Details

The method and time of construction for each part of the development should be described, including borrow pits, roadways and other transportation facilities, construction camps, interruption of natural processes such as stream flow and lakes. Any effluent, emission or noise or aesthetic impairments should be described.

3.11 Abandonment

Information on the following items should be provided:

- control of contaminated seepage and runoff water from mine workings, waste rock, tailings, etc.
- stabilization and reclamation of disturbed lands and tailings impoundment areas, i.e. rehabilitation.
- townsite, mill and other facilities

3.12 Energy Conservation

Plans for energy conservation should be outlined.

4. DESCRIPTION OF THE EXISTING ENVIRONMENT AND RESOURCE USE

The Initiator is expected to provide baseline information about the chemical, physical and biological characteristics, and renewable resource use of the environment, in the vicinity of the mine site and other areas which may be affected by the development.

Environmental information should be based on relevant scientific reports and previous on-site investigations.

The proponent should be prepared to conduct preliminary investigations when available information is deficient. This section should be developed in terms of the following, where applicable:

4.1. Climate

A description should be provided of the climate of the general area, including information on weather elements that will affect development. Particular emphasis should be given to statistics on wind, the frequency, height and intensity of temperature inversions which may affect the dispersal of air pollutants, and to extremes of precipitation and winds which may cause damage to structures. A summary or analysis of the on-site weather observations that have taken place and their relationship to nearby longer term records is desirable.

4.2. Terrain and Geology

Physiography, geology and soils of the area should be considered, including land forms, elevations, slope and stability, drainage, unique land form or geological features. Consideration of surficial geology and permafrost should also be included.

4.3. Hydrology

Consideration should be given to the hydrological characteristics of those waters receiving waste materials from the proposed development, and all other waters which may be affected by the development. Information considered should include, on a seasonal basis, characteristics of standing, flowing and intermittent waters, including where applicable: bathymetric maps; stream characteristics; maximum, minimum and mean water levels, temperatures and flows, current and flow velocities; estimated drawdowns; stream behavior (shifting, flooding and scouring); ice conditions; dates of freeze-up and break-up; seepage and groundwater characteristics; marine currents and tides.

Information about the physical and chemical characteristics of water bodies and their associated bottom sediments likely to be affected by the development should be provided, particularly for those waters which will receive waste materials. Particular attention should be given to those constituents likely to be present in any effluents.

4.4. Biological Characteristics

A significant part of the environmental information evaluated should include descriptions of animal and plant communities, important interrelations, and potential changes that may be caused by the development. The depth of review will depend on the nature and extent of the development. A systematic approach to the biological analysis should be developed from preliminary landform studies which identify broad freshwater, marine and terrestrial habitat types. Within this framework, the Initiator should estimate the distribution of animal and plant populations, and identify critical habitat components. To establish the sensitive biological components, species within the area of development should be reviewed in terms of their roles in maintaining the natural communities and their social and economic importance.

a) Terrestrial Flora and Fauna

- Vegetation communities should be evaluated in terms of species composition and major plant groups.

- Consideration should be given to distribution and abundance of big game animals, fur bearers, small mammals, migratory birds, upland game birds, and any rare or endangered species that permanently, seasonally, or occasionally occupy areas of potential influence.

- A distribution list should be provided of all wildlife species known to occur in the area, with particular reference to rare and endangered species and those economically significant to local human populations.

- Current and historic human activities and their effects on the plant and animal resources should be carefully documented.

b) Freshwater and Marine Flora and Fauna

- The biological characteristics of all waters which come under the influence of the development should be reviewed with respect to plankton, macrophytes, invertebrates and fish. Consideration should be given to their distribution, diversity, relative abundance and interrelationships.

- An estimate of commercial, domestic and sport values of fish stocks in the area, together with a list of other important species should be provided. The frequency of occurrence of freshwater and marine mammals in the development area, with numbers and species, should be noted.

- Information on major bird species, including colonial sea birds, frequenting the area, seasonal use patterns, nesting times and sites and food habits should be considered.

4.5. People

Consideration should be given to the distribution and characteristics of the human population (life patterns, communities, employment, public facilities, housing) and cultural, social and economic setting of the general area.
Consideration should be given to the cultural history of the study area, including the location of palaeontological, archaeological and historical sites of significance.

4.6. Present Land and Resource Use and Status

The ownership and special status of the development property and adjacent lands should be reported. In addition, the registered water rights of streams and water bodies that will be used or affected should be provided. The actual land and water use should be considered for both the development and adjacent property. The Initiator should review and present a summary of local and regional plans for the area under consideration. Information should be provided on the commercial exploitation of renewable resources in the mine site and adjacent area. Information on annual production, annual value, work force and seasonal variations in these activities should be included.
Consideration should be given to present and proposed recreational use of the area and its unique physical features.

5. ENVIRONMENTAL IMPACTS

This section provides a methodology for obtaining the information summarized in Section 2.3. The section should identify and compare the expected environmental impacts of the development and feasible alternatives.

The assessment of short and long term potential environmental impacts should be made on the basis of information collated from all sources.

Options and measures available to avoid, minimize or mitigate harmful impacts and to enhance beneficial effects are to be considered and identified under each topic listed in Section 4. Potential environmental impacts, both expected and accidental (spills), in the area to be affected by the proposed development, should be identified in terms of existing environmental, economic and social values and should be identified in the development, construction, operation and maintenance and abandonment phases of the project. These impacts should be considered as international, national, regional, local or site specific.

Impacts identified as major (more important) are to be discussed in detail in Section 6, and those of a residual nature are to be expanded in Section 7.

6. MAJOR IMPACTS AND MITIGATING MEASURES

The Initiator should identify and discuss the major environmental impacts which may result from the development. Major impacts are identified as those of long and short term that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of, or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health of segments of the human inhabitants (deleterious as well as beneficial impacts); or significantly change the environmental options.

The following should be outlined as part of the discussion of each major environmental impact for each alternative:

- description of the environmental impact in terms of the above;

- mitigating or ameliorating measures that can eliminate or reduce the severity of deleterious impacts, for example, through changes in location and design of facilities, or through the environmental education of the construction and operational staff and measures to enhance beneficial impacts, as well as contingency plans to be effected in case of major accidents.

- plans for surveillance and monitoring of environmental effects.

7. RESIDUAL IMPACTS

The environmental impacts that will remain after all practical mitigating measures have been incorporated into the alternative development proposals should be discussed in this Section in terms of nature, extent, duration and significance of all such impacts in the environmental, economical and social sphere, and in the international, national, regional, local and site specific context.

8. ANNEXES

The Initiator should supply

8.1. An annotated list of references cited; and,

8.2. Copies of reports developed from studies associated with the evaluation.

G U I D E L I N E S

to prepare an

INITIAL ENVIRONMENTAL EVALUATION

for

I N D U S T R I A L D E V E L O P M E N T S

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

INDUSTRIAL DEVELOPMENT

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1. OVERVIEW SUMMARY

The overview summary should consolidate the important findings of the report and should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media (if this is required), or for use by senior executives requiring a quick appraisal of the situation.

The overview summary should briefly describe the project, the probable major environmental impacts, the ameliorating and mitigating measures to be implemented by the assessor, and the significance of the residual unmitigated environmental impacts. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2. THE PROJECT SETTING

2.1. Declaration

The Initiator and/or proponent should be identified and asked to take responsibility for statements and judgements in the IEE.

2.2. The Need

The need for the product(s) or service(s) should be outlined in terms of historic, present and projected demands. Interrelationships between differing and competing processes and/or products as a means to fulfilling demand and location of the demand, should be addressed. Other characteristics including the timing aspects, should be clearly outlined. Adherence to planning schemes of any level of government should be noted.

2.3. Alternatives

The Initiator should provide a description of the alternatives considered, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the environmental risks, costs and benefits of all considerations.

Economic, social and environmental factors for each feasible alternative should be discussed in relation to other alternatives to the proposed development. Continued use of existing facilities where they exist, and cancellation of the project should be considered as alternatives.

2.4. Associated Projects

The relationship of the proposed industry to other existing or proposed industrial projects should be outlined. The discussion should not be limited to related industries but should apply to all industry in general, including its impact on such related facilities as electrical transmission lines and power generating facilities, marine terminal facilities, downstream water supplies, and other cumulative effects as they may encourage or inhibit existing or future development. In cases involving the development of a region generally, the relationship to the overall planning should be clearly indicated.

3. THE PROPOSAL(S)

The alternatives not disposed of in 2.3 should be discussed under each heading. The factors common to all alternatives should be discussed first, followed by a description of the factors pertinent and peculiar to individual alternatives.

3.1. General Layout

a) The proposed location(s) of the facilities in relation to principal geographical and environmental factors should be illustrated on topographic or aerial photographs of suitable scale.

General location and extent of an overall impact including resource-based raw material supply can be shown on 1:250,000 scale maps while progressively larger scale maps can be used for exact location of a specific jurisdiction. The jurisdictional areas should be clearly illustrated particularly when more than one may be involved.

b) Pertinent physical features of the proposal including temporary construction facilities should be defined such as heights of buildings, stacks, outside conveyors, layout of roads, railraods, pipelines, transmission lines etc. particularly as they may relate to existing facilities such as airports, marine terminals, existing railroads, or major highways.

c) The extent of any area set aside as a buffer zone between the development area and other areas, such as residential or park land, etc., should be delineated.

d) Areas considered for potential expansion should be outlined.

3.2. Construction Details

The Initiator should describe:

a) The method and timing for each part of the proposal beginning with the initial surveying and clearing of the site, to the final cleanup after construction is complete.

b) The place and method of obtaining local bulk building materials; for example quarry products, lumber, cement etc. Also source of water supply (potable, and non-potable).

c) Construction site security including location of hazardous bulk materials such as fuel and explosives, compressed gases, solvents, etc.

d) Temporary fencing and routes and frequency of security patrols, access points for construction workers, parking lots (on and off the construction site) should be designated on an appropriate site plan.

e) Location and other details such as construction and maintenance of access roads, increased use of existing roads and other transporatation facilities. On extended construction schedules, the class of roads and their carrying capacity under various climatic conditions including load limitations during spring break-up, should be notes.

f) Location of watercourse crossings to be used for roads, railroads associated with the project.

g) Location, size, duration and services of any temporary construction camps; including those used for preliminary fabrication.

h) Location of any temporary major service points such as electrical transformers, fire pumps, first aid stations, management and local supervisory and sub-contractor offices and sewage treatment plant.

i) Interruption or alteration of natural processes such as river flows and lake levels, in terms of timing, degree of change and other pertinent variables.

j) Location and description of any effluents, emissions solid waste disposal areas noise or a-esthetic factors caused by the construction.

k) Details of final cleanup and landscaping operations, including measures to conceal such facilities as effluent treatment lagoons, permanent surfacing of exposed ground, and permanent security features such as fencing.

l) Schedules of construction, relocations, development of transportation and other public use facilities for both temporary and permanent employees, (indicate the numbers, sources, and housing needs of the work force).

3.3. Operation and Maintenance

The following items should be detailed with respect to scheduling and methods.

a) The major timing and other commissioning details of each part of the proposal(s).

b) Water supply and waste water disposal requirement, in terms of quality, location and volume.

c) The volume, timing, characterization, and other details of expected air emissions, water effluents, noise, solid waste and hazardous solid waste disposal.

d) The aesthetic features of the project.

e) Any permanent alteration to natural processes such as river flows and water quality, air movement, ground water characteristics, growth of flora, changes in lake levels.

f) Use of buffer zones to mitigate such effects as noise and air emissions.

g) Provision for access to the plant without reliance on residential routes.

h) Changes in traffic volume type and frequency due to operation.

i) Requirements for major social and recreational facilities such as schools, churches, etc.

j) Requirements for local contract services, frequency and timing.

k) Potential for future expansion on existing proposal site.

l) Contingency planning for hazardous materials, incidents in transportation, handling and storage.

m) Provisions for fire protection either temporary or permanent.

3.4. Termination or Abandonment

The Initiator should describe termination or abandonment procedures including:

a) Expected life of the project
b) Disposition of all buildings and equipment
c) Potential uses for buildings with equipment removed
d) Criteria which might be used to decide abandonment, including bankruptcy.
e) Major problems which might occur as a result of abandonment; e.g. fire, air or water contamination.

4. ENVIRONMENTAL IMPACTS

The Initiator should describe and compare the expected environmental impacts of the feasible alternatives in:

a) the long and the short term

b) the existing environmental, economic and social values on an international, national, regional, local or site specific basis, and should identify each in the design, construction, operation and maintenance, and abandonment phases of the project.

Options and measures available to avoid, or mitigate harmful effects and to enhance beneficial effects are to be investigated and discussed under each of the foregoing categories. Plans for surveillance and monitoring of environmental effects should also be detailed. Major impacts are to be discussed in Section 5.

The Initiator should consider and discuss all potential environmental impacts in the area to be affected by the proposed development in the following terms:

4.1. Climate

a) Temperature - normal daily and seasonal variation and extremes

b) Winds - velocity, frequency, direction and duration of critical wind speeds, major prevailing direction, stratification

c) Precipitation - kind, amount, duration, frequency

d) Temperature inversions - Type and intensity as they relate to dispersal of atmospheric pollutants and other potential causes of environmental impact.

e) Potential for combinations of temperature, humidity and emissions causing visibility problems on adjoining highways and streets.

f) Destructive storms such as extensive rain, sustained high winds, hurricanes and tornadoes.

4.2. Terrain

a) topographic, physiographic, and geological features within the area of proposed action,

b) physical and chemical characteristics of the soils

c) permafrost, slope stability, or erosion problems

d) recognized geological and hydrological hazards such as landslides, mudflows, floods or earthquakes

e) land suitability and capability factors, particularly when large areas are to be utilized or removed from actual or potentially other uses such as agriculture or recreation, either as a direct or indirect result of the proposal.

4.3. Water

a) biological, chemical and physical characteristics of surface and ground waters in the proposed area of impact

b) biological and benthological assessment of stream, lake, river or ocean beds

c) velocity, volume, temperature, colour and other physical characteristics of major water bodies effected by the proposal

d) potential for alteration of existing water bodies due to erosion, siltation, temperature of discharges, and construction of underwater dikes, dams, breakwaters, cribwork, outfalls pipeline, diffusers.

e) location of water supply sources downstream of the facility at or near surface and ground water bodies

f) potential for discharge preventing downstream users from utilizing the water for any purpose, including recreational and other industry.

g) location and volume of water to be either removed or added to natural water bodies.

4.4. Flora

a) plant communities by species composition, their relative abundance, and importance as habitat and food species, with particular reference to timber for lumbering and papermaking operations

b) effect of air emission on local flora both with and without unusual climatic conditions

c) effect on relatively undisturbed plantlife.

d) effect on rare or unique vegetation or plant life of special historic, scenic or economic value

e) effect of effluent discharges on marine flora

4.5. Fish and Wildlife

a) The species and population of crustaceans, fish, amphibians, reptiles, birds and mammals whose habitat are to be affected by the proposed development.

b) Effect on any rare, endangered, commercially or recreationally significant species of fish or wildlife.

c) Any upsets which may occur in the nesting, spawning or migration patterns of the fish or wildlife due to the proposed development or its adjunct operations.

4.6. People

a) Population numbers, distribution, employment, facilities and housing in the immediate and outlying areas adjacent to the development.

b) Cultural, social and economic setting of the area.

c) General level of education and/or skills required for the operation of the proposed development, and facilities available to support and/or enhance the requirements.

d) pre-startup training requirements and facilities, including safety and emergency procedures.

4.7. Land and Resource Use

On an appropriate scale the following should be broadly outlined:

a) Agriculture, such as: crops, dairying, mixed farming, grazing, livestock, poultry, orchards, as they may be affected by even minor levels of air pollution or water quality degredation.

b) Forestry, such as timber - mature or immature, protection belts, reforestation projects.

c) Wilderness, such as: provincial or national parks, areas administered by Conservation authorities.

d) Urban, such as: residential, commercial, industrial, recreational

e) Archealogical, such as: historic and scenic land use sites

f) Ownership and usage of adjacent property

g) Status of regional plans for industrial development

h) Zoning laws as they affect areas to be developed

i) Traditional land use patterns (native hunting, trapping, fishing and areas of religious significance)

j) Non-renewable resources such as fossil-fuels

5. MAJOR IMPACTS AND MITIGATING MEASURES

The discussion should describe and compare the expected environmental impacts with emphasis on those actions which are likely to cause major environmental disruptions. The assessment of short and long term potential impacts should be made on the basis of information collected from existing sources supplemented by field data. Where factual data is unavailable or of questionable quality, the report should clearly state that the predicted effect(s) was based on subjective judgement and that knowledge gaps exist. Impacts should be considered for the preconstruction, construction and operation phases of the project.

The Initiator should consider and discuss all potential impacts in the area to be affected by the proposed industrial project in terms of the categories listed below and any others considered pertinent. Options and measures available to avoid, minimize or mitigate harmful effects should be investigated and discussed under each topic. General mitigation considerations would include changes in location, design, scheduling, or operations (processes).

5.1. Aesthetics

Objections to the physical plant can be a major concern. This concern demands subjective decisions as to what constitutes the best visual impact. The Initiator should outline his intentions with respect to the general design and layout of the buildings and adjacent property with regard to:

a) height of buildings or process facilities

b) major equipment to be left open to the weather

c) storage areas for surplus equipment

d) loading and unloading facilities

e) suppresion of emissions which are not normally considered air pollutants (e.g. condensated steam from drying operations)

f) general landscaping and buffer zones

5.2. Air Pollution

The Initiator should discuss in detail the measures to be taken to comply with existing regulations, expected levels of emission. The Initiator should also discuss anticipated public reaction to, and details of mitigating measures in the following categories:

a) process upsets which overload control facilities

b) failure of control facilities to function

c) emergency procedures in the event of a serious air pollution problem which potentially could cause injury or death over a wide area.

d) an inventory of all materials or chemicals and their likely effect in the event of an unforseen or uncontrollable circumstance.

5.3. Water Pollution

The Initiator should discuss and anticipate public reaction to the measures to be taken to comply with existing or anticipated regulations. The Initiator should discuss mitigating measures in the following categories:

a) expected impact on receiving waters of normal discharges

b) potential impact of process upsets or failure of some or all of control facilities to function

c) emergency procedures to correct operational problems, and if necessary, to warn public of the loss of quantities of hazardous material

d) an inventory of all chemicals to be used in the process and their potential to cause a water pollution problem in the event of an unforseen or uncontrollable circumstance.

e) an inventory of all chemicals that may be associated with fuel stockpile, run-off, leaching, deposit of air emissions (acid rain).

5.4. Noise

Based on current similar operations the Initiator should discuss the expected level of noise from the operations, the measures taken to mitigate the spread of noise, the anticipated noise levels at various critical distances from the operation including those generated as a result of incoming or outgoing transportation.

5.5. Monitoring and Surveillance of Environmental Effects

The Initiator should provide information and base-line data prior to construction, and should monitor during and after construction and start-up any potential environmental effects in the following categories:

a) Water - colour, turbidity, bacteria, benthos, water chemistry

b) Air - any parameter which may be affected by the start up of the operation, such as, sulphur dioxide, particulates, carbon monoxide, nitrogen oxides, etc.

c) Noise - in decibels at various locations including in particular those in the vicinity of public places such as parks, public buildings, churches, schools, etc. A general statement of the expected effect of earth shocks and noise due to blasting during construction.

Mitigating factors such as trees, noise reduction practices, buffer zones, etc. should be detailed and assessed as to their effectiveness in reducing noise.

d) Solid Waste - disposal areas for solid wastes and the measures to be taken to mitigate their effects, particularly if there is any involvement with secondary effects such as leachates which may enter a receiving water.

e) Effects of use of any extraneous control chemicals such as pesticides, herbicides, etc., and information on their expected persistence, toxicity and mobility in atmospheric, aquatic, and terrestrial environments, including groundwater.

f) Unusual effects to be expected in radio or television interference from such equipment as precipitators, transformers, high tension lines, and general electrical interferences including welding

5.6. Fish and Wildlife

a) plans for routing around or otherwise protecting areas used as breeding or staging grounds for migratory waterfowl or fur-bearers

b) scheduling or construction activities and evidence that the project contains the flexibility to cease construction when areas critical to fish, wildlife, or waterfowl are temporarily threatened

c) safeguards proposed for the habitats of highly valued, rare or endangered species

d) methods of minimizing wildlife harrassment during construction; control of possession of firearms by construction personnel

e) restoration of fish and wildlife habitats following construction.

5.7. Environmental Briefings and Monitoring

a) briefings to alert personnel of environmental restrictions during the pre-construction, construction, and operation phases

b) continuous surveillance and maintenance programs for the electric power transmission right-of-way

c) plans to monitor the environmental side effects during and after construction, including the progress of revegetation

6. RESIDUAL IMPACTS

The environmental impacts that will remain after all mitigating measures are complete should be detailed in terms of:

a) nature, extent, and duration of impacts in the environmental and socio-economic spheres

b) the environmental significance of the potential residual impact

7. ANNEXES

The annexes should include:

7.1. an annotated list of references cited - i.e. documentation

7.2. copies of reports developed from studies associated with the evaluation.

APPENDIX A

THE ENVIRONMENTAL ASSESSMENT AND REVIEW PROCESS (EARP)

PROCEDURES AND RESPONSIBILITIES

INTRODUCTION

The Cabinet, by decision of December 20, 1973, established the federal environmental assessment and review policy. At the same time, the Minister of the Environment was directed to establish, in cooperation with other Ministers, a procedure for administering the Environmental Assessment and Review Process. Procedures were developed and approved by the Inter-departmental Committee on the Environment.

Experience in the application of the policy and the procedures indicates that some changes in the procedures are warranted. This document provides a revised set of procedures to describe more clearly the several steps necessary in the process and the responsibilities of the participants.

PART 1 - DEFINITIONS

The following definitions are relevant to the process:

(a) Initiator	a federal department or agency which intends to undertake or sponsor a project, or group of projects having potential environmental effects and is thereby required to take appropriate action according to the policy.
(b) Proponent	a company, province or other organization outside of the federal government which intends to undertake a project, or group of projects having potential environmental effects within the scope of the process.
(c) Initial Environmental Evaluation (IEE)	a documented assessment of the environmental consequences of any intended project, or group of projects having potential environmental effects, prepared or procured as early in the planning stages of development

(c) Initial Environmental Evaluation (IEE) (cont'd)	as possible by the Initiator in accordance with general guidelines established by CEAP.
(d) Environmental Impact Statement (EIS)	a documented assessment of the environmental consequences of an intended project, or group of projects expected to have significant environmental consequences, completed early in the planning stages of development by the Initiator in accordance with guidelines established by the Panel for that undertaking.
(e) Environmental Assessment Panel (EAP)	a group of officials and/or outside experts appointed to review an Environmental Impact Statement and advise the Minister of the Environment.
(f) Chairman, Environmental Assessment Panels (CEAP)	the DOE official appointed to carry out the responsibilities assigned to the Minister of the Environment by the Environmental Assessment and Review Policy with respect to the administration of the Environmental Assessment and Review Procedures. The Office of the Chairman comprises the Chairman and necessary staff to provide support to the Panels and carry out other duties related to the process.
(g) Regional Screening and Coordinating Committee (RSCC)	a committee of DOE officials established in each of several regions to coordinate DOE interest and involvement in actions falling within the mandate of DOE including, in part, the advisory function of DOE under the environmental assessment and review procedures.

PART II - APPLICATION

These procedures will apply to all federal departments and agencies for projects or groups of projects initiated by the federal government, or where federal funds are solicited, or where federal property is required. Federal Proprietary Crown Corporations and regulatory agencies are invited to participate.

PART III - PROCEDURES

As early in the planning process as possible, the Initiator will screen all projects or groups of projects for probable environmental effects.

For those projects with no probable adverse environmental effects, and those who's environmental effects are known and are not considered significant, the procedures outlined below are not applied. (It is the responsibility of the Initiator/ Proponent to implement the requirements for good environmental design to mitigate the adverse environmental effects identified).

If these effects are considered significant by the Initiator, the project is referred to the Panel for a formal review.

For cases where the nature of the potential adverse environmental effect is not fully known, the Initiator will complete or procure, possibly through the proponent, an Initial Environmental Evaluation. Guidelines approved by CEAP are available to assist the Initiator in the preparation of an I.E.E.

During the screening process, and in the development and review of the I.E.E., Initiators are encouraged to seek advice from DOE through RSCCs or CEAP. (The RSCC will keep CEAP informed of the advice provided to Initiators on the adequacy and accuracy of those Initial Environmental Evaluations submitted to it for review, including the significance of the environmental effects described therein).

Based on the review of the Initial Environmental Evaluation, the Initiator will decide on the significance of the environmental effects. If the Initiator does not consider these effects to be significant, the project may proceed as planned without further reference to EARP. The Initiator is however responsible for implementing appropriate environmental design measures to mitigate adverse environmental effects identified in the I.E.E.

Projects or Groups of Projects Having Significant Environmental Effects

Departments and agencies will submit to CEAP directly, or through RSCCs, any project or group of projects which in their opinion, will have a significant effect on the environment. Advice on the "significance" of the undertaking may be obtained from DOE in general, or from RSCCs or CEAP.

CEAP will arrange for the establishment of an Environmental Assessment Panel. The Initiator will appoint one member to the Panel. DOE members will be appointed by CEAP. The Panel will be chaired by CEAP, the Vice-Chairman or an Acting Chairman appointed by CEAP.

The Panel will issue to the Initiator specific guidelines for preparation of an Environmental Impact Statement. The guidelines will be available to the public, unless otherwise directed by the Minister of the Environment in consultation with the initiating Minister(s).

Note: Considerable data gathering based on the guidelines may be required. Therefore, the project will be submitted in the early stages of planning in order that the development of plans may not be interrupted unduly for the collection of baseline data and production of the Environmental Impact Statement.

The Initiator will undertake to prepare or procure an Environmental Impact Statement based on the Environmental Impact Statement Guidelines and submit the statement to the Panel. Of course, the Initiator will take into account all relevant legislations in the development of the project proposal.

The Panel will receive the Environmental Impact Statement and will determine its completeness and acceptability; will require the submitting department or agency to provide background information from their studies in order for the Panel to carry out its responsibilities; will obtain such information and expert opinion from DOE, other federal departments and agencies and others as it requires for the analysis of the Environmental Impact Statements submitted to it; will make the Environmental Impact Statement public (unless otherwise directed by the Ministers); will provide sufficient time for public response; will ordinarily hold a public meeting where briefs may be presented by the public; will evaluate the Environmental Impact Statement; will determine the adequacy and appropriateness of the measures proposed to mitigate and ameliorate the adverse effects and enhance the benefits; will make appropriate recommendations to the Minister of the Environment.

The Minister DOE will review the Panel report with the Minister of the initiating department/agency. The report of the Panel to the Minister DOE will be available to the public unless otherwise directed by the Minister of the Environment in consultation with the initiating Minister(s).

The Initiator will incorporate ministerial decisions based on the review of the Environmental Impact Statements in the design, construction, implementation and operation of projects or groups of projects. In the event that there is disagreement between the Ministers involved on the recommendations made by the Panel the matter would normally be referred to Cabinet for resolution.

Responsibility for surveillance and monitoring resulting from ministerial agreements based on Panel recommendations will be assumed by the appropriate agency.

Where the federal government joins with a provincial government in preparing an environmental assessment, CEAP will ensure adequate federal-provincial consultation, including the selection of appropriate Federal or Provincial procedures for assessing such projects. Following agreement by the Initiating department, provincial representatives may be invited to sit with the Panel during the review. The Initiator will be responsible for including the appropriate provisions in any pertinent federal-provincial agreement.

The policy on allocating financial responsibility between the federal government and non-government projects for this process is under review. When this policy is determined, appropriate procedures will be inserted herein.

PART IV - RESPONSIBILITIES

The Chairman, Environmental Assessment and Review Panels

The Chairman's responsibilities are:

(a) to appoint the DOE members of Environmental Assessment Panels (other than the Initiator's representative), and to appoint an Acting Chairman of a Panel in the event that the Chairman or Vice Chiarman is unable to serve.

(b) to provide advice to departments and agencies on the responsibilities of the various participants in the Environmental Assessment and Review procedures; to advise on the submission of projects or groups of projects to a Panel for review.

(c) to approve general guidelines and provide advice on methodology for departments/agencies and others carrying out environmental assessments and preparing Initial Environmental Evaluations and Environmental Impact Statements.

(d) to make recommendations to the Minister of the Environment resulting from Panel reviews of projects or groups of projects having significant environmental impact.

(e) to provide functional direction to the DOE Regional Screening and Coordination Committees on policy or procedures within the environmental assessment and review procedures framework.

(f) to carry out a review of the implementation of the Cabinet decision and to report to the Minister of the Environment as appropriate.

(g) to manage the office of the Panel Chairman.

Environmental Assessment Panel

An Environmental Assessment Panel will be constituted to review each submitted project or group of projects having significant environmental effects.

The Panel will be chaired by CEAP, the Vice Chairman, or an Acting Chairman. Representatives from DOE will be appointed by CEAP and one member will be appointed by the Initiator.

The duties of the Panel, as they relate to the undertaking for which each Panel is established, are:

(a) to develop and issue the Environmental Impact Statement guidelines to the Initiator.

(b) to advise the Initiator, on request, during the development of the Environmental Impact Statement.

(c) to determine the completeness and acceptability of the Environmental Impact Statement.

(d) to require submitting departments or agencies to provide background information from their studies in order that the Panel can carry out its responsibilities.

(e) to obtain such information and expert opinion as it requires for the analysis of the Environmental Impact Statement.

(f) to make the Environmental Impact Statement available to the public (unless otherwise directed by the Minister of the Environment after consultation with the initiating Minister) and to provide sufficient time for public response, and ordinarily to hold meetings where briefs may be presented by the public.

(g) to evaluate the Environmental Impact Statement and to determine the adequacy and appropriateness of the measures proposed to mitigate and ameliorate the adverse effects and enhance the benefits.

(h) to make recommendations to the Minister of the Environment through CEAP, resulting from the review.

Responsibilities of all Government Departments Including DOE

In relation to the environmental assessment and review procedures, the responsibilities of all departments and agencies including DOE are:

(a) to carry out or procure and act on the results of IEEs and EISs as indicated in Part III - Procedures.

(b) to advise CEAP on request on general guidelines for Initial Environmental Evaluations.

(c) on request, to advise Panels on Environmental Impact Statement guidelines.

(d) on request, to advise Panels on the accuracy and adequacy of Environmental Impact Statements.

(e) to ensure that surveillance and monitoring resulting from an agreement based on Panel recommendations are carried out and that CEAP is kept informed.

(f) to advise on the cumulative environmental effects of projects.

(g) to carry out baseline studies as required to develop good advice.

Responsibilities Particular to DOE

(a) to advise on request other government departments or CEAP, on the significance of environmental effects for any project or group of projects described in an Initial Environmental Evaluation.

(b) so far as other departments are concerned, the function of the RSCCs is to provide advice. The responsibilities of RSCCs as they apply to the environmental assessment and review procedures are as follows.

DOE REGIONAL SCREENING AND COORDINATING COMMITTEE (RSCC)

The responsibilities of the RSCC as they apply to the environmental assessment and review procedures are:

(a) to receive requests for advice and ensure that complete responses are provided through coordination among DOE Services.

NOTE: Where initial contacts are made with Services within DOE, recipients of these initial contacts will ensure that the Secretariat of the RSCC is immediately notified in order that the RSCC can carry out its coordinating responsibilities.

(b) to provide advice, approved by CEAP, to departments and agencies on the responsibilities of the various participants in the operation of the Environmental Assessment and Review Process.

(c) to establish mechanisms with the provinces with a view to coordinating activities under the Environmental Assessment and Review Process.

(d) to register all projects immediately upon receipt of information and provide a regional focal point for these projects.

(e) to agree upon or recommend a lead Service from within DOE relevant to registered projects.

(f) to coordinate advice to Initiators on the applicability of legislation and regulations administered by DOE for the project under consideration and normally to provide such advice through a lead agency.

(g) to ensure that CEAP is provided with copies of those Initial Environmental Evaluations received at the regional level immediately upon receipt.

(h) to provide advice to the Panels normally through lead agencies on proposals requiring Environmental Impact Statements.

(i) to coordinate the regional contribution to the development of Initial Environmental Evaluation and Environmental Impact Statement guidelines.

(j) to review recommendations formulated by the lead agency on Initial Environmental Evaluations and to ensure that the Regional Board and CEAP are advised.

(k) to coordinate reviews of Environmental Impact Statements and advise, normally through a lead agency, the Regional Board and CEAP.

(l) to assist CEAP in the post-audit of Initial Environmental Evaluations.

(m) to provide up-to-date status information on all phases of projects.

(n) to report to the Regional Board of Directors.